THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LX. No. 1538.] LONDON, NOVEMBER 1, 1892. [44TH YEAR. PRICE 6d.

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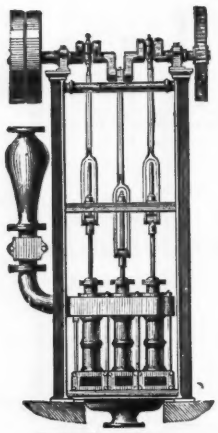

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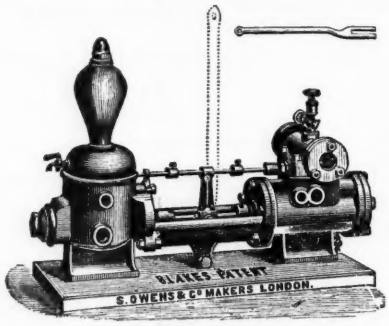

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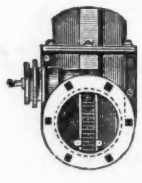

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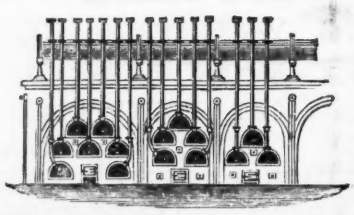

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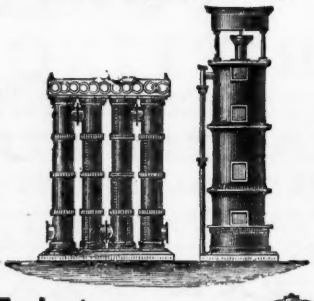

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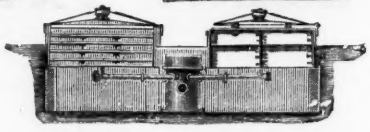

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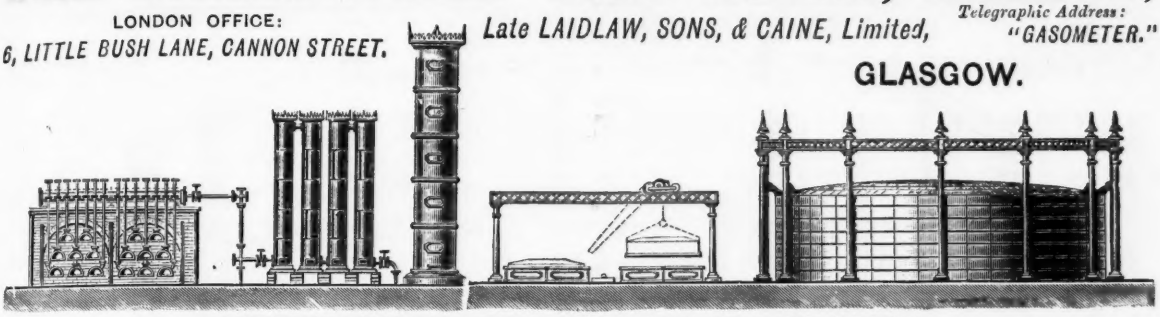

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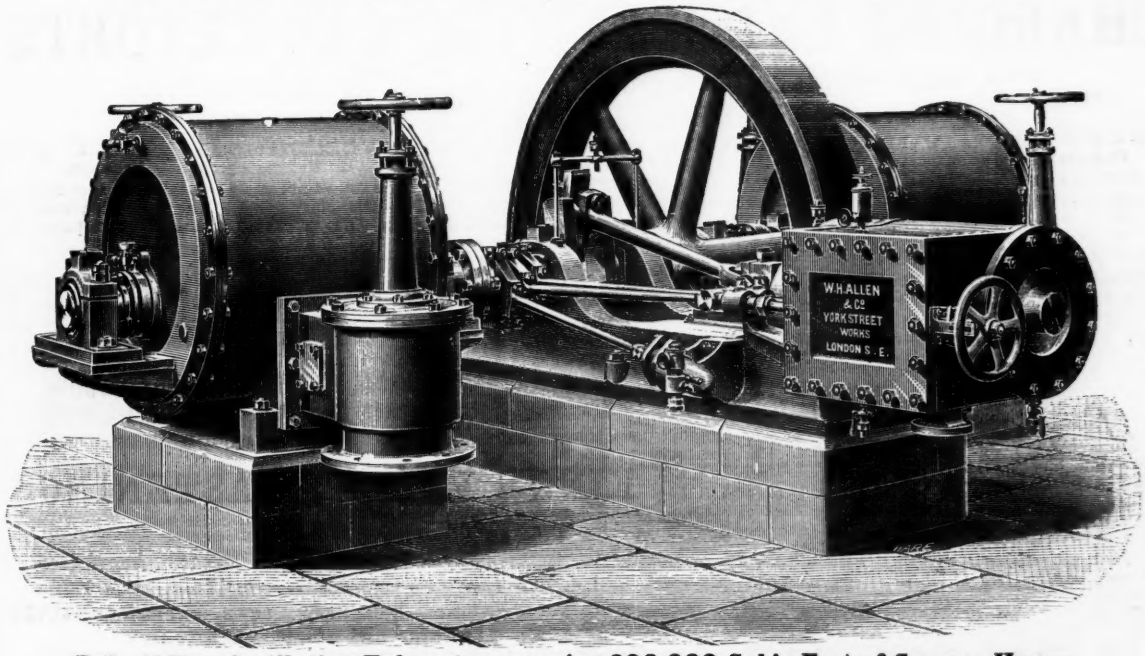

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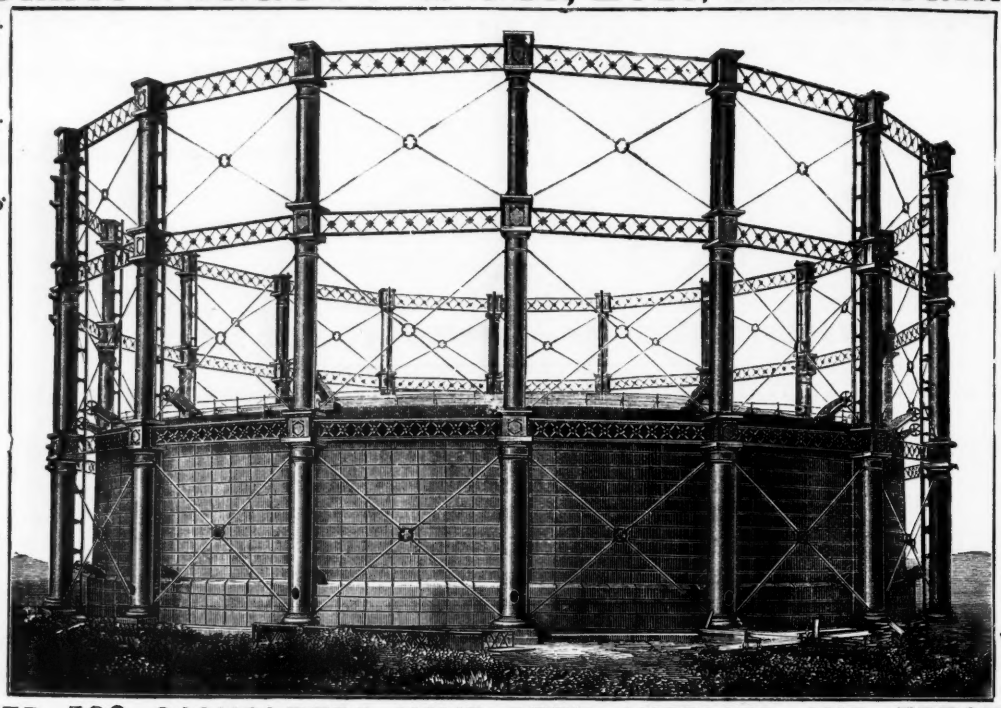

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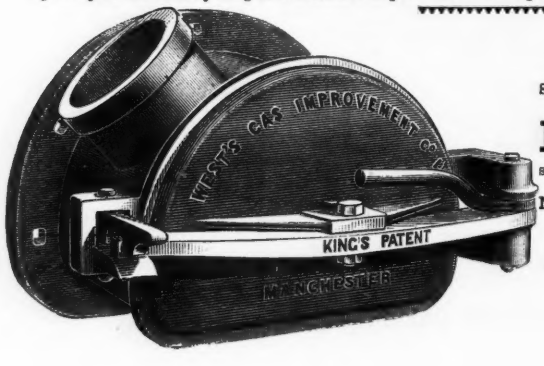

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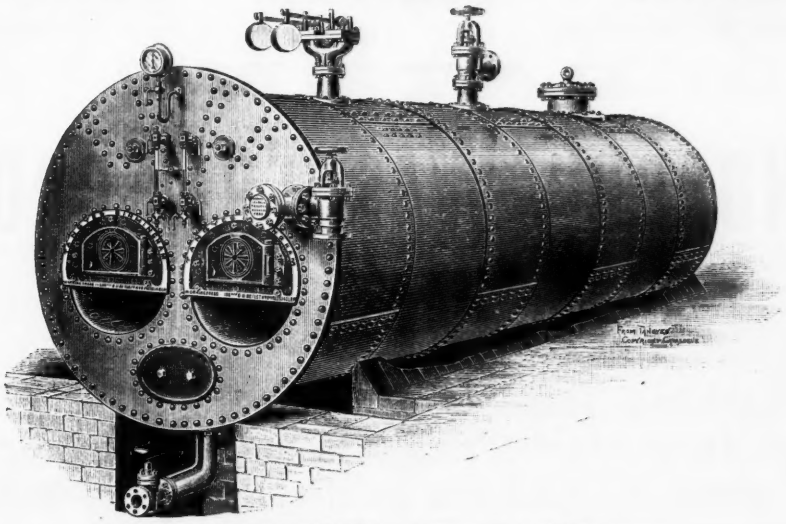

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I am, yours truly,
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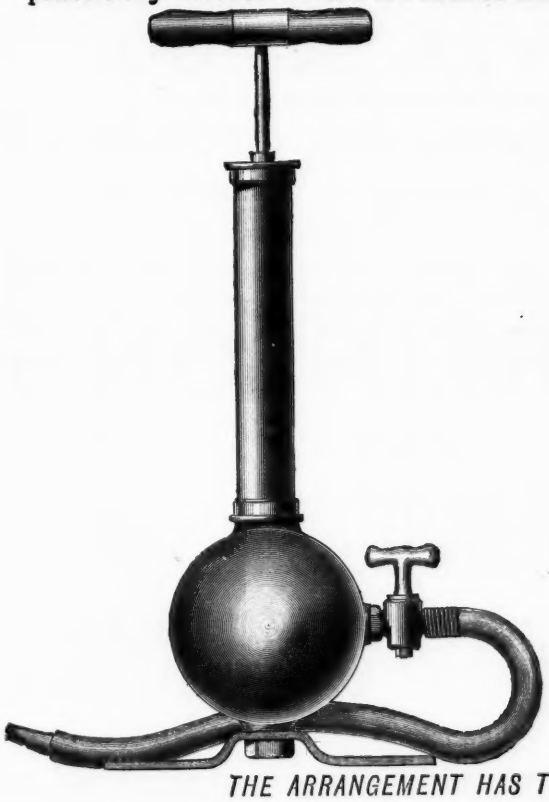
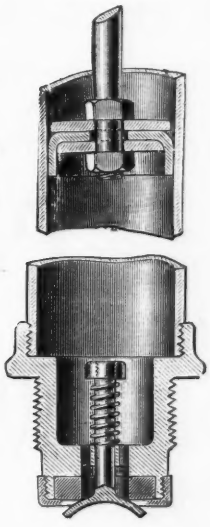


PLUNGER CUP.



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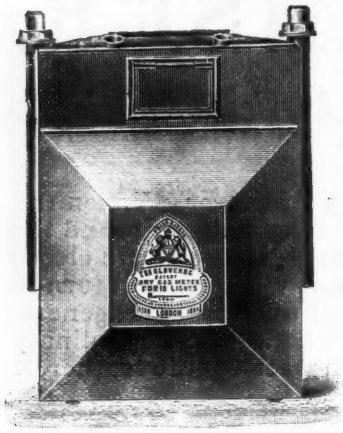

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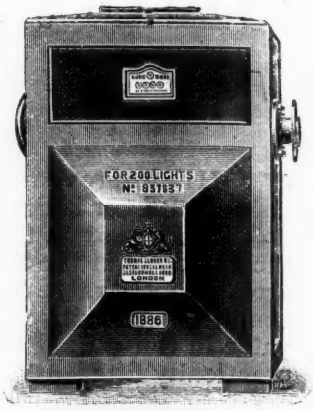

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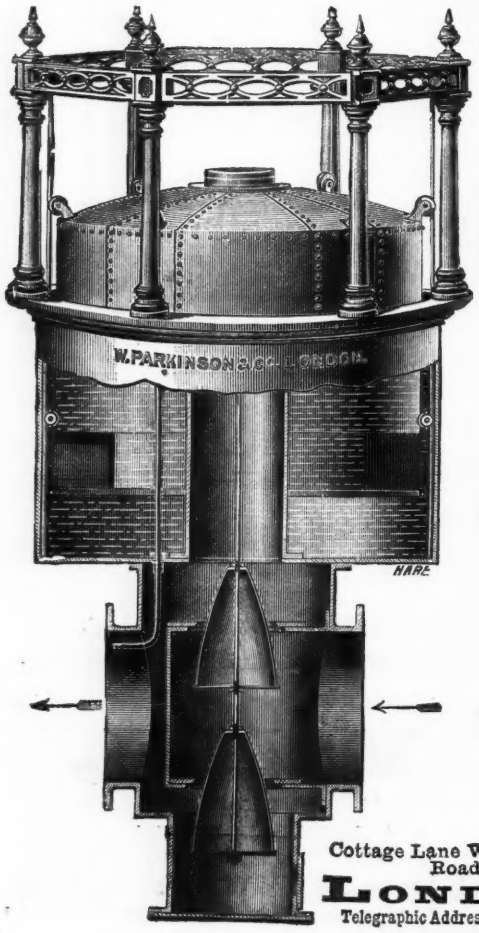

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A very large number are now at work; and all Engineers who have adopted them speak in unqualified terms of their great efficiency.

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[See also Advt., p. 796.

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TO ADVERTISERS.

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THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, NOVEMBER 1, 1892.

Labour Topics.

THE Royal Commission on Labour have resumed their sittings; last week being mainly devoted to the collection of an interesting and valuable mass of information respecting the condition and prospects of the co-operative system. This week an opportunity will be afforded to theorists such as Messrs. Tom Mann, Sidney Webb, and others, for expounding their notions about the Municipalization of Labour, Eight-Hourism, and so forth. We do not know what the future arrangements of the Commission may be; but it appears to be highly desirable that the advocates of Trades Unionism, who have had so much to say upon their own side of the question, should be counterbalanced by a sufficiency of witnesses to the degrading tendencies of Unionism as applied in occupations demanding skill and character. Witness has been borne to the evil of its coarser effects, as manifested in the oppression of gas stokers and free labourers in connection with the strikes at Manchester and in South London. Up to the present time, however, it does not appear that the working of Trade Societies at the other end of the scale has received due attention. The organizations of skilled workers have a trick of calling a business establishment which does not accept the *status* of a "Society house" by the question-begging title of "unfair;" and they try to make out that such houses always pay lower wages, and employ inferior labour, as compared with those in which Trade Union rules prevail. Now, while this may be so in some instances, it is most emphatically not so in all—perhaps not in the majority of business houses which have repudiated all Society domination. It is notorious that the trades in which the individual character and skill of the workman count for something in his earning capacity are deteriorated by the influence of Unionism, which, as understood and applied by the all-powerful Society officials, tends to a levelling-down of performance to an average, or "Union stroke." It may be argued that this influence is not a necessary effect of Trades Unionism. Possibly not; but the theoretical Unionism which one hears about in fervid platform speeches is a very different thing from practical Unionism, as every employer knows. It is this discrepancy between the pictured and the actual that renders well-meaning ministers of religion, mayors, lords, prominent philanthropists, and similar unpractical people, so useless in their often-essayed part of mediators in trade disputes. They think that they possess a general knowledge of Trades Unionism; but they cannot feel its particular developments. Unionism in the abstract does not annoy anybody, because it is of the same quality as that "wrong in the abstract" which, as the witty American declared, "is always unpopular, and never gets "pitied—because 'tis what nobody ever committed." It is the "particular sins" that give trouble; and so it is the hundreds of minute developments of Trades Unionism that cause friction between employers and employed. Wherefore the Commission should give ear to a few of the better class of workmen who have found Unionism incompatible with the free play of their powers.

We remarked recently that the undeclared "motive" of the New Unionism is the effacement of all difference in the rate of earnings of skilled and unskilled workers. This seemed at the time a rather bold assertion; but we have not had long to wait for the corroboration of our view, upon authority which must be regarded as valid in this respect. Speaking at a meeting of the Gas Workers' and General Labourers' Union on Saturday week, Mr. Keir Hardie, M.P., adopted the principle in all its native nakedness. He also said that the reason for the difference in wages between skilled and unskilled work was that "circumstances, aided by a powerful trade organization, "had enabled the one party to obtain a fairly decent wage "as things went, whilst adverse circumstances, helped "by the lack of organization, had left the others in the "position in which they were." Of course, this is simply Socialism, not business; but the remarkable thing is that the people listen to this sort of talk, not as the dreamings of a Socialist, but as expressing the settled opinions of a practical man respecting the needs of the order of the community to which he belongs. Workmen are very keen critics of the utterances of professional statesmen, preachers, and others of rank differing from their own, when they attempt to discuss industrial problems. Yet when men who call themselves representatives of the working classes talk balderdash of this kind, it all seems to go down for gospel.

The Midland Meeting—The Retirement of Mr. Simpson.

THE members of the Midland Association of Gas Managers met in Birmingham on Thursday last, under the presidency of Mr. W. Littlewood, of West Bromwich; and there was

a large attendance, drawn by the exceptionally interesting character of the occasion. There was an attempt to discuss Mr. Hack's paper, read at the autumn meeting last year, on "Elliott's Process of Continuous Carbonization," which did not amount to much more than a recognition of the justice of Mr. Hack's conclusions. A paper was contributed by Mr. T. B. Jones, of Willenhall, upon the not very new topic of stopped ascension-pipes. The author did very well with his hackneyed subject; and, if the members generally did not bear him out in the opinion that he has found the specific remedy for a long-standing evil, Mr. Jones has the satisfaction of feeling that he is not the only doctor of ailing ascension-pipes who has failed to communicate his skill to others. Not to the business part of the day's proceedings, however, did the special quality of attractiveness attach. The reason for the filling of the place of meeting to overflowing was the incident of the Simpson presentation. Mr. Peter Simpson, whose name has been associated with the gas supply of Rugby, and whose kindly presence has been welcomed at gas managers' meetings, since a time that may almost be described as prehistoric, has reached that age when the strongest and most active of men may blamelessly retire to a well-earned repose; and his old friends of the Midland District would have been unworthy of companionship with such a man, if they had allowed him to retire from public life without showing that they appreciate those sterling qualities of the head and the heart of which Mr. Simpson has been the exponent from his youth up. His claims to be honoured by an Association of Gas Managers were most worthily set out by Mr. Charles Hunt; but everyone who has the slightest personal acquaintance with him will be able to add something from his own recollections to this brief statement of Mr. Simpson's manifold good qualities. However sharply members of the gas engineering profession might be divided among themselves, none ever quarrelled with Peter Simpson, of Rugby; and, while many places have made more noise in the world, there has been no better work done than that with which his name is identified. Such a career as his furnishes its own justification. It is not Mr. Simpson's intention to sever his connection with the Midland Association—in token of which he has allowed himself to be re-elected Honorary Treasurer. The President for the ensuing year is Mr. B. W. Smith, of Smethwick.

The Responsibility for Lighting Public Lamps.

The Richmond (Surrey) Gas Company and the Corporation of the town have been engaged since the winter of 1890-91 in a dispute which, if it were not so pitiful an example of municipal littleness, might be laughed over as a most ludicrous piece of litigious folly. In the severe winter referred to, the Richmond Gas Company, like every other gas company and gas-supplying corporation in the South of England, experienced much trouble with the public lamps. Owing to the intense and continuous frost, an extraordinary number of the lamp-services became stopped with ice and naphthalene; and additional men had to be put on to look after them. But, notwithstanding this, of course, more than the usual average of extinctions occurred. When the next lighting bill went in to the Corporation, they raised a demand, by way of counterclaim, for the value of the gas supposed to be saved to the Company by these extinctions; and they asked what it was intended to allow for it. To this the Company replied that, so far from saving anything in this way, they had laid out a considerable sum of money in extra labour to keep the lamps alight; and they inquired whether the Corporation, who are the suppliers of water, proposed to make any allowance to the ratepayers whose services had been frozen at the same time. This response was, of course, stigmatized by the Corporation as "impertinent;" and the two parties were wildly rushing into law over the matter, when the Company moved to submit the question to arbitration, as provided in their Act. The Corporation agreed; but they nominated one of themselves—an Alderman—as their Arbitrator, who would not come to terms with Mr. George Livesey, the Arbitrator appointed by the Company. It therefore became necessary to choose an Umpire. This was done; the choice falling upon Mr. Shiress Will, Q.C. He could not compose the dispute, which by this time had settled into a question of law; and, after much going to-and-fro between the Company and the Corporation, the outcome of the arbitration took the form of a special case, stated by the Umpire for the decision of the Court, as to whether, on the premisses, the Corporation were entitled to claim a set-off against the lighting account. The circumstances are peculiar, inasmuch as the price of the public lighting is fixed by the Company's Act at £4 5s. per lamp per annum, to cover everything. They are consequently under an obligation to light the street lamps at this figure, under penalty for default; and the Company pleaded before the Court that, if they had made default, as alleged, the rightful remedy was by way of penalty only, not set-off. They argued that they had done everything possible to ensure the due lighting of the lamps, some of which had been nevertheless extinguished by causes beyond their control; and they claimed to be paid as usual. In the end, judgment was given for the Company; and so the Corporation have not only to "sing small," but have a handsome bill of costs to pay as a souvenir of their injudicious attempt to fine the Company for not having been able to do impossibilities. The result is worth remembering, as "an encouragement "for others." It may be stated that the value of the gas estimated by Mr. T. May, the Engineer to the Company, as unburnt by reason of the extraordinary extinctions, was about £12; whereas the Corporation's estimate was £180.

The Belfast Gas Question.

It can be pardoned in the good people of Belfast if they entertain the fancy that just at this time the eyes of all Europe are upon them, watching for their solution of the problem of gas-works extension that has of late been repeatedly mentioned in the Journal. We have taken notice of the difficulty of Belfast, because it is naturally interesting to us to follow the fortunes of an important gas undertaking during a crisis in its existence, and also because this particular affair really constitutes a trial of the trustworthiness of a Local Authority in respect of gas supply. For if the Belfast Gas-Works had been in the hands of a Company, there would be no difficulty about their extension, apart from the engineering question of the site. As it is, however, the electricians and their friends are making common cause with the party in the Corporation which happens to have some political or other reason for disagreeing with anything the majority of the Gas Committee may recommend; and so there is at least a chance, albeit we trust but a very slight one, that the gas consumers of the city may go short of light to gratify party passion. The funny thing is that the local opponents of the Gas Committee in the Corporation and the Press treat this question of the extension of the gas-works as though it were a "fad" on the part of Mr. Stelfox and his Committee, and therefore might be indulged or not as a matter of opinion. One of the local newspapers has fallen foul of us for commenting upon the matter, and describes our innocent remarks as "attacks." Well, if it is an "attack" to say of the consumption of gas in Belfast that it has increased, is increasing, and must be provided for, and that, however loudly the electricians may talk of what they are going to do, not one electric lighting concern in the world has yet succeeded in taking up the normal increase of the gas undertaking in the same spot, then we have "attacked" whoever denies these statements, whether in Belfast or elsewhere; and we shall continue to do so as long as there is the prospect that our words may reach the ears of sensible men. It is reported that certain electric lighting "authorities," unnamed, call the proposed extension of the Belfast Gas-Works "madness." Arethese the people who testified their sanity by ordering that fragment of a 10,000-horse power dynamo which lies in such eloquent repose upon the floor of the Deptford electric generating station? At any rate, if Mr. Stelfox and his allies have been overwhelmed by an unmanageable influx of business, there is not an electric lighting speculator breathing who would not like to be troubled with the same complaint.

The Disappearance of Tower Lights.

It is a somewhat saddening amusement to reckon over the burning questions in politics and sociology which we have watched grow cold, and to reflect upon the startling novelties and improvements in science and industry which we only remember when some chance leads us to disturb the dust of time upon their tombs. It makes a man feel old to think of such things. So it was that we were quite startled recently to read, in an American contemporary, that "the electric mast on Bridge Square, Minneapolis

"(Minn.), which is the tallest in the world, will probably "figure only in history in a short time, as the eight arc "lamps now used on the mast will probably be distributed "in points where they will be of better use." Why, it seems to be but yesterday that the JOURNAL was protesting, almost alone, against the heedless adoption in the United Kingdom of the great American novelty of "tower light-"ing," which came over in the same ship with "French "Measurement," and one or two other products of Western civilization. And it has come to this at last—that whoever wishes to see the tallest lighting mast in the world must hie him to Minneapolis, and that quickly, or he will be too late. How fond our American cousins seem to be of superlatives. Even the tallest lighting mast "in the world," useless as it has been found to be, seems to attract a certain amount of admiration. Why should not the city that can number amongst its denizens the "biggest fool in the world" be proud of the distinction? However, it is some slight satisfaction to learn that the ridiculous tower lights are being done away with at last, even where they have ranked among the wonders of the city that harboured them, as in the case in point. Great things were reported of the tower lighting of Minneapolis nine or ten years ago. According to a local newspaper, on the night when it was first started, the Town Council went for a drive round the city, upon photometrical aims intent. They wanted to discover just how far from the mast they could read the print of a newspaper. When they started, they could plainly read the head-lines in a paper upon an island in the river, presumably at a considerable distance from the source of the light; but "before the trip was ended, they couldn't have read a "paper if they had been on top of the mast." This singular effect of too much electricity, or something, has not been mentioned by writers of papers upon electrical subjects. It may be quoted to show, moreover, that local authorities should be careful to avoid meddling personally with photometry, and should always employ competent paid testing officers to supervise the public lighting.

The Modern Substitute for Greek Fire.

THE bursting of a cask of oil is credited with having been the cause of a disastrous conflagration which, on Friday night and the following day, reduced to ashes a large area of the flourishing town and port of Milwaukee, on Lake Michigan. Extensive fires in American towns do not usually impress foreign readers so deeply as would similar catastrophes, if they were possible, in European cities, mainly because of the general impression that wood enters so largely into the construction of American houses, that their destruction by fire is in a sense inevitable, sooner or later. Moreover, when an American town is one of those which are described in the language of the newspapers as "live" trading or manufacturing centres, the summary clearing away of the older "shanties" commonly turns out to be a blessing in disguise, as forcing upon the citizens the reconstruction of their places of business in more enduring materials. All the same, however, it is impossible to read the record of such a fire as that which has for the time being desolated Milwaukee, without reflecting upon the danger of those big accumulations of mineral oil which are an unavoidable concomitant of the age of cheap petroleum. How much fire damage has been due to "accidents" with mineral oil since it became a leading article of commerce! The few examples that recur to one's mind while giving merely a passing thought to the subject are enough to show that petroleum oil has been one of the best friends, or rather enemies, to the insurance offices that can be imagined. It is stated that the Milwaukee Gas-Works were partially destroyed in the fire; thereby bringing upon the unburnt portions of the city the additional plague of darkness. This effect will have a perfectly natural, but decidedly noteworthy consequence of increasing for some time the consumption of lighting oil in the remaining buildings; for while the gas-works are being repaired, which will be a work of weeks or months, the people must have light, and petroleum is the readiest means to this end. And so it will come about that the very illuminant which caused the damage will be most in demand for facilitating the work of repairing it. There is no reliable information yet to hand showing how or why the barrel of oil exploded; and nothing may ever transpire to clear up the mystery, as in the case of the historic cow and benzoline lamp of the Chicago fire. It is once more evident that petroleum is a risky thing to handle, even in barrels; and its increasing use in the arts is something over which national governments and local authorities can hardly be too watchful. Prudent restrictions and regulations bearing upon the storing, transport, and handling of this hazardous commodity may be denounced by interested traders as obstructions to commerce; but it is better to have mineral oils a fraction dearer than expose whole towns to the risk of destruction.

WATER AND SANITARY AFFAIRS.

IN connection with our remarks in the JOURNAL for the 18th ult., on the evidence given by Sir George Buchanan before the Royal Commission on Metropolitan Water Supply, a correspondent has called our attention to a passage in that evidence which may be supposed to express a more favourable view of the water supply of London than we have attributed to Sir George. The passage in question had not escaped our notice, as will be seen by two allusions made to it in the course of the article. It is an obscure passage, and has to be taken in connection with other portions of the evidence given by the same authority. In his opening remarks, Sir G. Buchanan made reference to an epidemic of typhoid which had occurred in the provinces. On this he was asked: "In a case of that "kind, if suspicion had been directed to the water supply, "what would you proceed to do?" Sir George replied: "To disuse the water, or to boil it." Later on the Commissioners asked, with regard to water in general: "If "you think the source of supply is polluted, does it have "any effect upon your mind what is the treatment of the "water after it is taken from the source?" Sir George replied "No;" and he added: "I intended to say 'No' to "such a question, when I made the statement, in some "previous answer, that I thought there was nothing for it "but either to boil the polluted water, or else to leave it "alone." Being asked whether his own house was within the Metropolitan area, an answer was given in the affirmative; and the following question was then put: "Do "you boil the water as it comes to you?" To this Sir George replied: "Not at all. I am perfectly content "with it as it is." If nothing more had been said, we should have experienced no difficulty in apprehending an approval of the Metropolitan Water Supply. But Mr. Mansergh inquired: "When you say leave it alone, you "mean not use it?" Sir George replied: "Exactly." Are we to understand that this "leave it alone" applies only to the early question as to the typhoid epidemic in the country, and not to the water supply of London? It is very important that any ambiguity on this point should be got rid of. Is Sir G. Buchanan "content" with the London Water Supply "as it is?" Or does he "leave "it alone?" The statements on this point are so paradoxical that one inference would be as good as the other, were it not that the general tenor of the evidence given by Sir George is such as to inspire doubt concerning the purity of the London Water Supply. We have said: "It would be "interesting to know what water it is that Sir G. Buchanan "drinks." He has not been asked whether he even filters the supply he receives. We may suppose he takes it as it comes; or, instead of taking it, "leaves" it.

Certainly we have no desire to make Sir G. Buchanan appear as a witness adverse to the present Metropolitan Water Supply. Yet his evidence as it stands can hardly be called favourable. The intention may be simply to induce caution; and, of course, it is not easy to effect this without the risk of exciting distrust and apprehension. But we cannot yet see that we err in ascribing to Sir George a determination to discountenance, if not absolutely to reject, any water which does not proceed from what he would consider an unpolluted source. We have argued that pollution is a question of degree, and that the degree may be in some cases so minute as not to justify a verdict of condemnation. To know what the pollution has been, we would judge by the effect. For this purpose, the water has to be tested by chemical and bacteriological methods. But Sir George practically repudiates any such tests. He explained the position thus: "I may say that the interest "of the Medical Department in respect of any given "specimen of water consists, almost exclusively, in "learning about the sources of water." "If we have to "investigate the quality of a water," says Sir George,

"we care about where the water comes from, and what it "has encountered on its way to the place of its delivery." To this he adds: "I do not think we care greatly about "much else." Even if the water passes the chemical and bacteriological tests, this will not avail if the water has not an immaculate "history." Admitting, as he freely did, the correctness of the results reported by Dr. Frankland in his examination of the London waters, Sir G. Buchanan declared that "the processes were of no earthly "value for the demonstration of morbid elements." If the water developed no microbes at all under the gelatine plate culture, it was suggested that such organisms might be produced if the conditions of the experiment were changed. Doubtless Sir G. Buchanan fully believes in his own theories. But if at the same time he is "content" with the supply given to him by one of the London Companies, the rest of the population may be contented also, unless it be that Sir George gets his water from a chalk well, in which case it would be desirable for him to say so. A little explanation on one or two points would be of very material service.

Mr. R. Bodmer, the Public Analyst for St. Saviour's, Southwark, has been revelling in the infinitesimal, and descanting on the alarming impurity of water containing 0·190 part of organic elements in a volume of 100,000 parts. On such figures as these, the Southwark chemist has ventured to declare the supply "decidedly impure," and scarcely fit to drink. As Mr. Bodmer has succeeded not only in frightening himself but also the Local Authorities, and has referred to the reports presented by Mr. Crookes and Dr. Odling as confirmatory of his statements, it has been needful, in the interests of the public, to show that the "scare" is without foundation. In the JOURNAL for the 4th ult., we dwelt on the absurdity of the position taken up by Mr. Bodmer, and mentioned the reply already given by Mr. Louttit on behalf of the Lambeth Company. Last week, Mr. Crookes and Dr. Odling dealt with the subject in a letter to *The Times*, showing that nothing more was involved in the question than certain "minute variations in the amount of a very "minute constituent of the Metropolitan water;" such variations really being of no practical consequence. The maximum proportion of organic matter in the September supply was found to be a quarter of a grain per gallon, or scarcely more than the 3000th part of 1 per cent. If minute quantities are to be regarded, there is the remarkable fact, as announced by the two eminent experts named, that there has been "an insignificant decrease" in the proportion of organic matter present in the water of the Thames at the intakes, beyond that present 150 miles higher up, where the main stream is first recognized as a definite river. By this we are apparently to understand that the excess at the lower point over the proportion at the higher has undergone a slight diminution. The fact is encouraging, especially in view of the favourable conclusion arrived at by the Royal Commission of 1869. Sir T. Spencer Wells, in a letter to *The Times* yesterday, asks whether the water supplied to London "does or does not "contain the germs of infective diseases?" The answer may be twofold. The germs are very nearly exterminated in the filter-beds; and diseases proper to polluted water are so rare in London as to be fully accounted for in other ways.

Messrs. Alfred Lass, Wood, and Co., of 30, Gracechurch Street, E.C., have taken into partnership Mr. E. W. Drew, A.C.A., who has been associated with the business for many years past. The style of the firm will continue the same.

Private Bill Legislation.—The Executive Committee of the Association of Scottish Public Bodies, which has actively promoted the transfer of Private Bill Legislation from Parliamentary Committees at Westminster to a Local Commission sitting in Scotland, have resolved to approach the Government with a view to the introduction of a measure into Parliament next session on the lines of the recent Private Bill Procedure (Scotland) Bill, and of the report of the Joint Committee of Lords and Commons issued in 1888.

Resignation of Mr. A. Gunn.—At a recent meeting of the London County Council, the General Purposes Committee reported that they had received from the Controller to the Council (Mr. A. Gunn) a letter requesting permission to resign his appointment, on account of ill-health. They recommended that the request be granted; and this was agreed to—a retiring allowance of £660 per annum being awarded to him. Mr. Gunn was appointed Accountant to the Metropolitan Board of Works in 1869, at the age of thirty-two.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 785.)

THE course of movements in the Stock Markets during the past week has been generally in agreement with that of its predecessor. Prices continue to dwindle down from the points to which they were too suddenly advanced a fortnight or so ago. Most of the chief departments were quite dull; and profits were readily taken where they were obtainable. After the settlement, which was satisfactorily concluded, general quietude prevailed; and with the prospect of the House being closed to-day (which is an annual holiday on the Stock Exchange), the continuity of business was broken. The value of money is steadily rising; and already an advance in the Bank rate from 3 to 4 per cent. is being talked about. Such an advance is likely enough; but at that point, when attained, the rate ought to be good enough to last out the year. The Gas Market has been rather more quiet; but the symptoms of firmness which we observed last week have developed into a good general advance in values, more especially in the issues of the Metropolitan Companies. Gaslight "A," after opening steady, and remaining for a day or two very inactive, changed hands at improved figures; and the quotation was pushed up 2½. But the highest price obtained in an actual bargain was 219. Good steady business continues to be done in the secured issues; and, notwithstanding the growing value of money, they stand well up to their quotations. South Metropolitans are sailing along gaily before the favouring breeze of popularity; and capital prices were procured for the "A" and "B." Both quotations are still rising; and "B" is already very near a 5-per-cent.-for-money figure. Commercials also are brisk at an advance; and they look like going better. The Suburban and Provincial undertakings are almost stagnant—next to nothing doing in them, and no change discernible. The Continental Companies may be quoted much in the same way—quiet and firm. Few of the rest of the Foreign contingent exhibit any feature; and the few changes apparent are somewhat irregular. Among South Americans, Bahia and Buenos Ayres debentures are rather better; but San Paulo has lost a portion of its recent advance. Chicago second mortgage bonds have risen 3½. None of the Water Companies showed much activity, except Lambeth. But the tone was favourable; and Grand Junction and Kent have advanced.

The daily operations were: The opening on Monday was decidedly good; and the Metropolitan Companies' issues of all sorts found ready buyers. South Metropolitan "B" went up 2; but San Paulo fell ½. Grand Junction Water gained 2. The general characteristics of Tuesday were similar; and improvements in value progressed. South Metropolitan "A" rose 4½; and Chicago Seconds, 3½. On Wednesday there was a lull in business, but quotations showed an advance of 1 in Gaslight "A." San Paulo dropped another ½. Thursday's transactions were reduced almost to a minimum; and quotations remained unchanged. On Friday there was a recovery in business activity; and quotations rose again. Gaslight "A" improved 1½; Buenos Ayres debentures and both Commercial issues, 1 each; and Bahia, ½; while Kent Water also rose 1. Saturday's business was a good average; and prices were well maintained.

ELECTRIC LIGHTING MEMORANDA.

Electric Lighting Currents and Gas-Mains—The Diminution of Illuminating Power in Old Incandescent Lamps—An Electric Omnibus—The Alternate Current System Rising in Favour.

AN article by M. Claude in *L'Industrie Electrique* refers to the trouble that has been experienced in Paris of late in connection with the underground electric lighting mains conveying low-pressure continuous currents, which, as is also usual in this country, are of bare copper enclosed in conduits. M. Claude remarks that accidents, becoming more frequent every day, are making it clear that these "canalizations" possess defects which could not have been foreseen, and can now only be made good by taking minute precautions. The damage done by these electric mains assumes various forms; one of the commonest being the pitting and eventual perforation of gas-pipes running in their vicinity. At the same points the stoneware conduit, or the trough containing the conductors, becomes filled with a mass of soda and potash salts, sometimes to the extent of several kilogrammes, although externally the conduit does not exhibit any sign of injury. The conductors themselves, especially the negative main, are so powerfully attacked that some of these, having a sectional area of 40 square millimetres, have been burst. This is no question of a particular instance, but is a phenomenon common to all the Parisian electric lighting districts. In Paris the gas services are of lead; and these being often very close to the electrical conductors, are frequently attacked; but there have been several instances of tarred cast-iron and sheet-iron gas-mains similarly affected. A good deal of heat is at the same time generated in the surrounding soil. It has been sought to explain certain street explosions by the hypothesis of a collection of electrolytic hydrogen in the conduits; but in the case of the explosion in the Rue Notre Dame de Lorette no less than 52 gas service-pipes were found perforated. The origin of the action is ascribed by M. Claude to the progressive electrolytic reduction of the salts contained in

the subsoil, which eventually accumulate sufficiently to destroy the insulation of the electric mains. The Paris Gas Company are devoting particular attention to this subject, which is of such capital importance to them; and the Parisian electricians are also seriously considering what can be done to remedy the evil, which furnishes a curious commentary upon the belief that continuous low-voltage currents are harmless.

Messrs. B. E. Moore and C. J. Ling, of the Cornell University, have been studying the nature and effects of the coating which accumulates inside the bulbs of incandescent electric lamps after prolonged use. When an incandescent electric lamp is maintained at a constant voltage, it is known that its candle power invariably diminishes. This loss of illuminating effect is attended by an increase in the amount of energy consumed per candle power of light afforded; the alteration being specially marked in the earlier period of the life of the lamp. These changes may be ascribed, says Dr. Nichols, to at least three causes—loss of vacuum; increase of resistance, due to the disintegration of the filament; and, finally, the deposition of the disintegrated carbon upon the inner surface of the lamp bulb. Messrs. Moore and Ling accordingly endeavoured to ascertain the character of this deposit—that is, to find whether or not it is colourless, or selective of particular rays, at what rate it is deposited, and how far it is responsible for the diminution in the brilliancy of the lamps exhibiting it. It was found that the colour of the deposit is neutral; its effect in this regard being merely to dim the lamp, without appreciably changing the quality of its light. The coating is deposited uniformly within the bulb, or in regular lateral zones. Summing up their results, the authors state that the rate of deposition of the coating of disintegrated carbon in the bulbs of incandescent lamps is greatest in the early life of the lamp. The loss of brightness due to the absorbing power of this coating is a variable part of the total loss; being greatest in lamps of high initial efficiency. The coating does not appreciably modify the character of the light emitted from the lamp. It is uniform with all kinds of filaments tested, and its absorbent capacity is in itself sufficient to account for a very considerable falling off in the candle power of such lamps.

The newest thing in road carriages with which the long-suffering streets of London are threatened is the electrical omnibus—a remarkable vehicle invented by Mr. Radcliffe Ward, who has had an experimental machine of the kind running occasionally for the last three or four years, and now claims to know all about the conditions of successful working, and to be able to satisfy them. The first licensed vehicle of the new order is to be put on its appointed stage "probably in a fortnight;" so that people who have still some faith in electricians' promises know what to expect. It should not be a cause of additional incertitude that this latest prophecy has been given to the world through the *Daily Telegraph*. We are told that the electric 'bus will carry twelve people inside and fourteen outside, exactly like an ordinary vehicle of the type. It will carry three sets of accumulators—a set consisting of 68 cells weighing 50 lbs.; so that the total weight of the omnibus in running order is brought up to rather more than 3½ tons, as compared with from 28 to 34 cwt. in the ordinary vehicle. But, as Mr. Ward says, the electrical omnibus "carries its horses on board." And this fact will make all the difference, unless we are greatly mistaken, when it comes to climbing Ludgate Hill on a "greasy" day. The average omnibus horse scarcely weighs 9 cwt.—probably not more than 8 cwt.; and hence considerably less than a ton of horse flesh does the work which hitherto more than double the weight of electrical accumulators have failed to accomplish. Even if the new venture is more successful in working than its precursors, all of which have known the degradation of being towed home by horses, there is still the question of running expenses to be considered, But this will come, if at all, after the omnibus has proved that it can run alone.

Considerable importance appears to be attached by electrical engineers to the fact that, after a prolonged and exhaustive study of the problem of supplying electricity for lighting, &c., to the City of Frankfort-on-the-Main, the two Consulting Engineers retained by the Corporation—Herr Oscar von Müller and Mr. W. H. Lindley—have fallen back upon the simple alternate-current system as the most suitable for all purposes. Our contemporary the *Electrical Review* devotes an article to this piece of intelligence, and evidently thinks very highly of the wisdom that has dictated the conclusion, the reasons for which are fully explained in a long and exhaustive report. The two questions respecting the utility of the alternating current as to which the greatest diversity of opinion prevails, are with regard to arc lamps and the practicability of making it available for motors. But Messrs. von Müller and Lindley prefer the alternate-current system even for these uses. Our contemporary remarks upon this that "of course upon all the other grounds of ease of distribution, economy, flexibility of system, and so on, practice has decided in favour of alternating currents, except for small condensed areas supplied from within; and it is significant that arcs and motors are now, in this authoritative way, added to the list of departments of electrical distribution that may be successfully undertaken in the same way." It is probable, moreover, that the Paris troubles mentioned in a previous paragraph will still further incline electrical engineers to prefer the alternate to the continuous system of supply for town areas.

GENERALIZATIONS.

THERE is a French proverb which says that "the better is the enemy of the good;" and the same lesson is taught in one of the most famous of Addison's "Spectator" papers, and illustrated by an epitaph upon an Italian gentleman, which runs *Sta bene; ma per stare megliore, sto qui*"—"I was well; but, trying to be better, I am here!" The lesson is not a hard one to learn, when pointed out; although, in the striving and bustle of existence, it is apt to be overlooked. It merely recommends contentment with whatever is, so long as it is endurable, and warns us against straining after an unattainable perfection. There is another side to this matter, however; and it is this which we now propose to discuss from an engineering standpoint. For if it is true that the better is the enemy of the good, it is equally true, conversely, that the good is often the enemy of the better. That is to say, especially in engineering, the thing which is "good enough" to serve the turn is commonly accepted as satisfactory, and effectually bars the way of possible improvement. This phrase "good enough," by the way, was an especial aversion of the late Sir William Siemens, who declared that it contains the root of much evil in regard to engineering materials and workmanship. He was wont to assert that nothing is good enough short of the very best; and he held that an engineer who would pass a piece of work as "good enough" would live to discover that, in most instances, the term really means "too bad to last." This belief of Sir William Siemens is likely to be regarded as a "counsel of perfection" by many engineers, who would be justified in opposing to it the potent consideration that the very essence of engineering consists in making the best of what is available for any particular purpose. It is all very well to say that "the best of everything is not too good" for our purposes; but when we have an object to achieve, and only indifferent means at command, is the object to be given up on this account? Material civilization would not have attained its present development if the latter rule had been imposed on engineers.

The point to which we desire to direct attention just now is a sort of corollary of Sir William Siemens's proposition; and yet it can be most easily understood when standing independently, as an observation upon contemporary engineering and industrial practice. In doing the work of the world, men act according to certain general principles, which can be deduced from the infinite variety of their occupations by those who know how to trace motives through actions. The so-called science of Political Economy is only a systematized collection of such principles of human action in the domain of trade as a succession of observers since Adam Smith have been able to distinguish and get together. So in the industrial branch of this science, those who would understand how things come to be as they are, must look out the underlying principles which actuate the workers; and according to the clearness and comprehensiveness of their insight will be the value of their deductions. Such a principle is that of the "acceptance of the good enough," which is one of the strongest habits of industrial man everywhere. No industry could get on without such a time and labour saving principle as this. The standard of the "good enough" varies from time to time, and is, on the whole, a rising one; but, at whatever degree it may happen to be fixed for the time being, it governs the average of effort and recompense.

Reduced to its simplest expression, this observation of ours means that when men engaged in any industry have succeeded in making something which serves their immediate purpose, whether of use or sale, the great inducement to improve is taken away. The moment anything can be said to "answer the purpose," the average man ceases to look for anything better. He is satisfied; and his satisfaction is of a perfectly legitimate and intelligible kind. Men always seek the "line of least resistance" in whatever pursuit they may be engaged, or they would not be men. The intelligence of the ant has been deservedly extolled; but no ant ever yet discovered that the nearest way past a post may be round it instead of up one side and down the other. The quality recognized as the line of least resistance is a distinctly human discovery; and, in all human affairs, those men who have possessed in the most eminent degree the faculty of finding this line, have gone farthest.

In the establishment of an industry by which average men are to live, it is absolutely necessary to keep to the rule of the "good enough." This decision constitutes the distinction between the experimental and the commercial stages of the development of an industry. Practically, the experimenter, if he is to do any trade in his specialty, must know when to say: "This will do; I will sell it as it is." Just so the workman has to decide when the requisite degree of finish has been given to the piece of work he has in hand, and when he can put his tools aside. Both the experimenter and the workman might conceivably go on refining and polishing the objects of their solicitude to an almost indefinite period; but this would not be business. Thus we see that Sir W. Siemens's aphorism does not always hold good, but that the great bulk of modern manufacturing industry is measurable by the standard of the "good enough" rather than by that of the "conceivably best." We could never get on at all if we were not prepared to accept all sorts of compromises between the quality which stands for perfection, and the inferior grade which can be said, and truly enough, to "answer the purpose."

Yet, since it is our duty to elevate our working standards, if we would not stand by and see them degraded by unintelligent and even disloyal service, it is desirable to keep our minds clear from all illusions as to their quality. If our working standards are based upon the principle of the "good enough," we should never shut our eyes to the central fact, and always look kindly upon attempts to raise them. The idle boasting to which certain industrial communities are inclined, and which exalts their productions, their tools, their methods, over the products, appliances, and processes of other communities, is a sad symptom of industrial blindness, and conduces to stagnation, which means decay. Speaking with special reference to the gas industry, it is sufficiently notorious that the most accomplished practitioners recognize everywhere in it the standard of the "good enough;" but the trouble of this, as an obstacle to the advent of the better, is hardly realized as it should be. When we declare that, with all its defects, coal gas is, on the whole, the best means of artificial lighting available for English towns, we do not utter an idle boast, but merely refer to the evidence in point supplied by the statistics relating to the incessant growth of the industry. Gas making and distribution are, however, far from perfect, although both appear to be "good enough," if judged merely by their vitality and meed of commercial success.

For instance, there ought to be a greater possibility of control than there is over the results of the destructive distillation of coal. It should be within the power of the work's manager to put upon the market as much or as little of the chief residuals of gas production as the market requires. Of coke—to name one of these—it may be said, in the majority of cases, to be just fit to burn, and no more; but this saleability upon its crude merits has hindered all attempts to improve its quality. The gas itself, in many places, is purified just enough to avoid raising popular discontent, and not a fraction more. The inevitable aroma of gas-works is kept within well-understood limits, beyond which prosecutions for nuisance might be apprehended; and there the solicitude of the manager stops. The proportion of gas unaccounted for is hunted down to some arbitrary figure; and no further care is taken in the matter. The dry meters which are such favourites in many districts, because they are less troublesome than the wet variety of this appliance, are admittedly unscientific in principle; yet they are accepted as being good enough for the purpose. How far this principle ramifies, it would indeed be difficult to say; but its strength can only be properly appreciated by anybody who endeavours to break through it, and introduce something better in place of anything actually existing and "serving the turn." Then it is seen to what an extent the good is the enemy of the better. In most cases the better itself is still far from the best; and this is an additional obstacle in the way of its adoption. In short, in these circumstances, both the work-a-day sufficiency and the ideal perfection appear to conspire together to prevent the small advance towards better things which is all that the conscientious improver can usually pretend to offer.

Still, so paradoxical are man's conditions of existence and utility upon the earth, that it is, after all, in the small advances and petty improvements which his experience suggests that his surest gains consist. For one epoch-making discovery upon which a new industry can be founded, there are thousands of useful inventions for saving time, material, or labour in the working out of known processes, the aggregate benefit of which is very considerable. Moreover, while it is not always the great discoverer who reaps the fruit of his intuition and perseverance, the ingenuity that saves the drop of solder or the superfluous tin tack is pretty certain of its recompense. There is little difficulty in obtaining proper reward for obviously economical devices, however petty. The trouble arises when the small improvement is not directly translateable into current coin. Who can tell what the community has lost through the lack of inducement to the adoption of small improvements which it would not pay anybody to patent, and which are beneath the notice of Acts of Parliament?

And so one is led to the conclusion of the whole matter, which is that, in the subject here treated of so briefly and cursorily, we have an illustration of the many-sided nature of truth; and since man can only see in one direction at a time, he can never survey more than one of these aspects—which is as much as to say that he cannot hope to see the whole of any great truth, or all round it, at one glance. Even here we have been able to expound, with illustrations drawn from the most practical and homeliest of sources, how true it is that the better is the enemy of the good; also that the good is the enemy of the better; and that the better is the chief agency whereby man may hope to progress towards the best. It is a fanciful idea, perhaps; but there is something impressive about the fact that certain commodities are even now being put upon the market as "100 per cent. pure." Electrolytic copper is an example of this absolute perfection of quality. How much painful endeavour does such a result represent? Material of this grade might satisfy the critical soul of Sir W. Siemens. But, unfortunately, it is even more difficult to get "100 per cent." workmanship than it is to find absolutely pure materials; and planning, material, and labour must go to the completion of every piece of work. Well, let us try our best to keep up the standard, not by any means despising the "good enough" upon which the main burden and stress of the world's service falls, but recognizing it for what it is, and keeping an opening for whatever is demonstrably better, even though the immediate advantage to be expected from the improvement may not be great. For who knows when or how the better may itself suggest an improvement which may be followed up to within measurable distance of finality in perfection? This is no allegory, but merely a little generalizing on a few familiar particulars. It is good exercise to occasionally hold a subject at arm's length, and look at it in different lights.

PROPOSED MEMORIAL TO THE LATE PROFESSOR HOFMANN.

THE functions to be observed in Berlin on the 12th of this month—the twenty-fifth anniversary of the German Chemical Society—are to include special memorial ceremonies in honour of the late Professor A. W. von Hofmann. But we are pleased to gather, from a notice which is now being circulated, that a more adequate memorial to this eminent scientist is in contemplation, inasmuch as his useful labours in the cause of scientific instruction and in pure and applied scientific research, in our own country as well as in his fatherland, have attached to his name a renown which merits perpetuation. The present scheme, with this end in view, is under the patronage of Her Majesty the Empress and Queen Frederick; and it has already received the support of a vast number of notable scientific men throughout Europe and the United States, including about fifteen English chemists, among whom the names of Perkin, Frankland, Vernon Harcourt, Lockyer, Gladstone, and Meldola will be familiar to our readers. It is proposed that the memorial shall take the very appropriate form of an establishment primarily to serve for the furtherance of chemical objects, but also to offer friendly accommodation to fellow-workers in other sciences. The establishment is to be called the Hofmann House. For this purpose, it is scarcely necessary to add, funds are required; and all who have received benefit from studying under the inspiring influence of the late Professor Hofmann, profited by the application of his researches to commercial purposes, and are desirous of doing honour to the memory of this great master, are invited to subscribe liberally. The Hofmann Foundation—a fund established on the occasion of the seventieth anniversary of the late Professor's birthday, to which he himself largely contributed, and which was to be employed as a chemical research fund—will now be fittingly utilized as a contribution to the present object. The movement is under the auspices of the German Chemical Society (Die Deutsche Chemische Gesellschaft, 35, Georgenstrasse, Berlin, N.W.), from which source any further information may be obtained, and to whose Treasurer, D. J. F. Holtz (170 and 171, Müllerstrasse, Berlin, N.), subscriptions may be sent.

Death of Mr. J. Page.—We regret to record the death, in his 78th year, of Mr. James Page, Chairman of the West Kent Gas Company, as well as of the Mitcham and the Kingston-upon-Thames Gas Companies. Deceased had been a Director of the first-named Company from the time of its formation as a limited liability undertaking in 1865; and, of course, he took an active part in connection with its incorporation two years later. His close attention to the interests of the concern is shown by the fact that he was never absent from a meeting until the 5th of September last. His connection with the directorate of the Kingston Company dated from 1866; and he succeeded Mr. S. Ranyard in the chairmanship in 1887. He was the oldest member of the Kingston Board of Guardians, to which he was first elected in April, 1863. He was also a member of the Rural Sanitary Authority; and had represented the Authority on the Lower Thames Valley Main Sewerage Board. Mr. Page a short time ago had an attack of influenza, from which he never thoroughly recovered. He was not, however, seriously ill until the 25th of August, on which date he attended the half-yearly meeting of the Kingston Gas Company, and was taken ill in the office. He was removed to his house (Coombe Farm), where he remained till his death.

Death of Mr. G. A. M'Ilhenny, of Washington.—We regret to record the death, on the 16th ult., of Mr. George A. M'Ilhenny, President and Engineer of the Washington (D.C.) Gas Company. Deceased was a native of the Sister Isle—having been born in the north of Ireland in 1835; but at the age of eight he went with his parents to America. He received his education in the public schools of Philadelphia; and, after completing the usual course, he chose the business of engineer and machinist—giving special attention to that branch of it which related to gas manufacture and supply. He advanced so rapidly, that, at the age of twenty-two, he was entrusted with the management of the Macon (Georgia) Gas-Works; and early in 1865, he was appointed Superintendent of the Washington Gas Company, which was then in its infancy. The growth of the great city necessitated considerable extensions of the works and plant; but Mr. M'Ilhenny was quite equal to meeting all the demands made upon him. On Nov. 15, 1883, he was elected President of the Company; and this position he held until his death. He was a member of the American Gaslight Association; having joined that body in 1873. He leaves a widow, but no children. A nephew—Mr. James M'Ilhenny—was associated with him in business; being Superintendent of the eastern station of the Gas Company.

NOTES.

Mr. Bryan Donkin, Jun., on the Flow of Air in Pipes.

Mr. Bryan Donkin, jun., has contributed to the Minutes of Proceedings of the Institution of Civil Engineers some results of measurements recently made by himself of the actual velocity of air in pipes. Mr. Donkin states that he was led to make these experiments in consequence of having to use anemometers for this purpose, and of his not being able to find any record of the indications of such instruments having been checked by actual measurements of air in bulk. The experiments were made by the aid of a small gasholder placed at his disposal by the Directors of the South Metropolitan Gas Company; and precautions were taken to obtain reliable results. The deliveries of the air were mostly made with ordinary rough and rusty cast-iron gas-pipes, between 8 and 24 inches in diameter, and between 9 and 12 feet long. But in one trial a smooth zinc pipe 8 inches diameter was used. The trials were varied by increasing the weight put upon the top of the holder, to give additional velocity of flow in the outlet pipes. The anemometer used was fixed inside the pipe. The general conclusion drawn by the author from his experiments is that anemometers should only be used with great caution for the measurement of the velocity of air in pipes of the diameters tested. The percentage of error was occasionally very high indeed, and was not at all constant. Mr. Donkin prefers as a simpler and more accurate way of arriving at the quantity of air delivered by a given pipe, the following procedure: "A small thin bent brass pipe, about $\frac{3}{16}$-inch diameter, is held with its open end facing the current of air, and is connected by a rubber pipe to an ordinary U water-gauge. The mean water pressure over the whole area can thus be carefully obtained. The mean head of water being given, the speed of air can easily be calculated by the well-known formula, or taken from a table. . . . This velocity, multiplied by the area of the pipe, will then give the quantity required."

Sugared Mortar.

The recent references in the building and engineering journals to the supposed benefits to be derived from adding sugar to lime mortar have induced *Indian Engineering* to refer to tests made in 1817 in connection with the building of a bridge across the River Cooum, at Madras, to ascertain whether there is any advantage in the process, which is admittedly an ancient Indian practice. Small pillars were, at the time referred to, built up with great care, some with sugared, and others with unsugared lime, and allowed to set for nearly a month, when it was found, by testing, that the tenacity of the former was about 74 lbs., while that of the latter was about 81 lbs. per square foot. Several similar experiments had been made before, and have since been repeated to the same effect; and it is concluded that "there is no reason to believe that in the end any advantage is derived to the mortar by the use of saccharine matter." The mortar is made more plastic by it, and works more easily. But, in reality, the sugar is a useless expense in the first instance, and is probably prejudicial to the final duration of the cement—first, because there is a considerable quantity of impurity in cheap sugary matter which may not combine so well as clean water, and, secondly, because quicklime is not easily slaked in sugared water. When this is used, many particles of lime may remain unslaked, or may be slaked so late as to disturb the crystallization of the mortar after it has commenced. The employment of saccharine matter was therefore discontinued at the Cooum bridge works, and its disuse has since been generally recommended for large and heavy works. It occurs to a reader of this record, however, that if there is in Madras a bridge which was known in 1817 to have been built partly with sugared, and partly with unsugared lime mortar, the condition of different portions of the structure to-day might supply an indication of the real value of the process in question.

Coke-Breeze Concrete.

In the "Student's Column" of the *Builder*, in the course of a series of useful articles dealing with building materials, mention is made of coke-breeze concrete, as frequently employed for floors, roofs, and partitions where lightness is required. It is remarked that such inherently weak materials as clinkers, breeze, &c., cannot make strong concrete; but as the weight of the concrete floor itself is often a very large part of the load it has to carry, the strength should always be considered in conjunction with the weight. A light concrete of moderate strength may carry a greater added weight than a stronger concrete of great weight. Mr. Webster's experiments go to prove that coke-breeze concrete suffers less from heating and quenching than do concretes made with sand, pumice-stone, fire-brick, and slag. A further advantage of coke-breeze concrete for floors is that it can be nailed to. Floor-boards can therefore be laid directly upon it without the necessity of wood joists or fillets, or an intervening space for air (and dirt). But this very lightness and porosity is a disadvantage where the concrete is required for walls, foundations, or where it is needed to sustain much weight. It is recommended that coke breeze intended for concrete should be thoroughly well wetted and washed before being used.

COMMUNICATED ARTICLES.

THE DECOMPOSITION BY SHOCK OF COMPOUND GASES.

By Harold B. Dixon, F.R.S., Professor of Chemistry in the Owens College, Manchester.

In his work "*Sur la Force des Matières Explosives*," published in 1883, M. Berthelot described some experiments on the decomposition by shock of certain bodies formed with absorption of heat. Most of his experiments were made on gases. He exploded a charge of 0·1 gramme of fulminate of mercury in a strong glass tube holding about 25 cc. of the gas. With acetylene, the experiment always succeeded (only about 0·01 cc. of gas remaining undecomposed), and a deposit of very finely-divided amorphous carbon was left on the walls of the vessel. Cyanogen was sometimes wholly decomposed; sometimes not at all. The other gases he succeeded in breaking up were nitric oxide and arseniuretted hydrogen. The decomposition, started by the fulminate, is, according to Berthelot, a detonation propagated from layer to layer with extreme rapidity, and is of the same nature as the explosion-wave.

In the *Journal of the Chemical Society* for 1889, Professor Thorpe stated that he had discovered accidentally that carbon bisulphide could be detonated with a bright flame in the same way, yielding a mixture of carbon and sulphur. No explosive, he says, would cause the decomposition except fulminate of mercury, and the brown powder obtained by the action of a fluid alloy of potassium and sodium on carbon bisulphide. The explosion of one-twentieth of a gramme of mercury fulminate will decompose the carbon bisulphide vapour filling a tube 600 mm. long and 15 mm. diameter. Thorpe accepts Berthelot's explanation, which he gives as follows: "The shock of the explosion communicates to the layer of gaseous molecules in immediate proximity to the fulminate an enormous active force, whereby the 'molecular edifice' is shaken to pieces, and the initial active force is augmented to a degree corresponding to the heat evolved in the decomposition of the gas. A new shock is thereby produced in the next layer, and the action is repeated, and so propagated."

According to this view, it would seem that the explosion once initiated in cyanogen, acetylene, or carbon bisulphide, should travel as far as the gas extends; and that the rate of explosion should conform to the laws governing the propagation of the explosion-wave in gaseous mixtures. It appeared, therefore, of interest to determine whether the explosion, set up by the shock of the fulminate, was propagated along a tube filled with one of the gases; and, if so, to measure the rate at which the flame was propagated. The experiments described below were carried out by Mr. J. A. Harker under my direction.

The first gas tried was acetylene. To produce the shock, a mixture of acetylene and oxygen (2 volumes to 3), one of the most violent explosive mixtures, was fired in contact with the acetylene. A coiled leaden pipe, 13 mm. in diameter and about 20 metres long, was provided with a glass firing-piece and tap at one end, and, at the other, a short tube of strong glass and a second tap. The whole was first filled with acetylene; and then a mixture of acetylene and oxygen was driven in at the firing end, so as to displace a column of the pure acetylene of about a metre in length. The taps were then closed, and the mixture fired by a spark. The explosion made the "ping" on the walls characteristic of extreme violence; but the flame did not appear at the further end of the tube. On examination, it was found that the great bulk of the acetylene was undecomposed. The experiment was repeated with the same result.

An apparatus was then fitted up to test the action of fulminate of mercury. It consisted of a steel cylinder or "bomb," holding about 400 cc., provided with a screw top, through which passed insulated copper wires, and having a tap for admission of gas. This was connected by a union-joint with a lead tube similar to that used in the last experiment, having at its other end a strong glass tube and steel tap. The bore through the joint was not less than that of the tube itself. The fulminate used was procured from the Roburite Explosives Company, in the form of detonators containing one gramme each. After each explosion the bomb was immediately detached, and the end of the leaden tube stopped by a cork till its contents could be examined. In no case was there any flame in the glass tube at the other end; and on testing the contents of the tube, it was found that the gas was never decomposed down the tube for more than about 15 centimetres (8 inches). The acetylene in the bomb itself was decomposed, and the sides of the bomb were covered with a deposit of fine carbon.

A second series of experiments were then made, in which carbon bisulphide vapour was used instead of acetylene. This gave a different result. On attaching to the bomb described a strong glass tube 1¼ metres long, instead of the lead one, and filling the whole, by exhaustion, with vapour of carbon bisulphide, one of the same detonators produced complete decomposition of the gas, and a deposit on the whole of the inner surface of the glass. A repetition of the experiment gave a similar result. An attempt was then made to measure the rate of transmission of this explosion. The passage of the flame down the tube was timed by making it break in turn two silver "bridges" stretched across the tube; each bridge being connected with a magneto-electric style tracing a mark on a moving

plate. In order to fire the fulminate at a given moment, the detonator was fastened by a caoutchouc ring in the end of a firing-tube filled with electrolytic gas. This firing-tube was screwed into the bomb, so that the detonator on one side was in contact with the electrolytic mixture, and on the other with the carbon bisulphide vapour in the bomb. The electrolytic gas was fired by an electric spark due to a circuit being broken by the moving plate of the chronograph; and the explosion was transmitted to the fulminate, and so to the carbon bisulphide. The bomb, with the detonator in position, was connected with a long glass tube, having a silver bridge about 1 metre from the bomb; and a delicate arrangement, capable of being adjusted to be broken by a shock of greater or less violence, at the other. The distance between the breaks was 5 metres. On repeating the experiment with this apparatus, the decomposition was in no case propagated for more than about 2·5 metres; the density of the deposit decreasing with increasing distance from the bomb. On repeating the experiment with a lead tube coiled up in a water-bath at 100°, the second bridge circuit was unbroken. The decomposition in the bomb itself is extremely violent; and a flash of intense yellow colour can be seen in the glass tube as far as the explosion proceeds.

It appears, therefore, from these experiments that the decomposition by shock of acetylene and carbon bisulphide is not propagated like the explosion-wave at a constant velocity as far as the gas extends, but that the decomposition set up by the fulminate dies out a distance from the detonator depending on the nature of the gas, and probably also on the intensity of the initial shock and the cooling power of the walls.

In a new series of experiments carried out by Mr. Harker and myself on chlorine peroxide ($Cl\,O_2$), we have found that the decomposition started in one portion of the explosive gas is transmitted throughout the whole mass. Moreover, the velocity of the explosion is constant, and of the same order of magnitude as the rate of the explosion-wave in detonating mixtures of gases. The experiments were carried out by filling a glass tube 30 feet long with the gas from the generating flask. A short "firing tube," containing electrolytic gas, was then attached to one end of the long tube; and the electrolytic oxygen and hydrogen fired by a spark. The explosion-wave set up in the electrolytic gas was communicated to the chlorine peroxide; and its rate was determined by making it break a silver bridge at the beginning and end of the tube. The rate of the explosion-wave in chlorine peroxide was found to be about 1100 metres a second.

THE UTILITY AND SCOPE OF A CHEMIST IN A GAS-WORKS.

By F. C. S.

The appointment by the Birmingham Corporation Gas Committee (as announced in the JOURNAL for Oct. 4), of a Chemist, whose time is to be devoted in great part to research, is one of the most notable marks of progress in the administration of gas undertakings (municipal or commercial) seen for many a day. It is an indication of real interest being aroused in the application of scientific knowledge and scientific methods in the development of industrial processes, and of belief in its commercial value. More than this, it shows a right appreciation of the direction in which science can most usefully be made to serve the interests of the manufacturer—which is not merely in being a handmaid, to carry out with greater facility and more certainty the old operations, but in being a pioneer to open out new fields of previously unsuspected possibilities for cultivation and development by the industrial arts. The former office is the one which is more readily perceived and clearly grasped. Thus the movement of late years in favour of the extension of technical education has hitherto been chiefly concerned with the instruction of workmen in the scientific principles underlying and governing their daily operations; and there was great danger that this might be considered its "be-all and end-all." It is therefore reassuring to find, from the action of the gas administrators in the capital of the Midlands, that, having followed the lead of the Germans in the more elementary applications of technical education, we are going on to emulate them in its higher developments. For it is well known that, in Germany, there has not only been available—what has only recently been, to any great extent, established here—a broadly comprehensive instruction in technical science, but also a practical appreciation of the benefits to be derived from the employment in commercial undertakings of scientifically trained minds, devoted to the elucidation of industrial problems. For example, in tar-derivative works it is not unusual to find a staff of trained chemists exclusively employed in the most recondite researches into the constitution and mode of formation of the less known carbon compounds. Although an immediate return for their labours, in the form of valuable discoveries leading to monetary gains, may not always result, the ultimate benefit must be real and substantial. In the industry with which we are chiefly concerned—that of gas manufacture—the field for the utilization of scientific, and particularly chemical, knowledge is as wide and as promising as is offered by any other branch of manufactures. Happily, it cannot be said that the field has been totally neglected; nor are we behind the Germans in the names we can show of worthy investigators into the chemical problems of gas manufacture. But whereas the employment in gas-works of chemists devoting more or less of their attention to original research, is no new thing, and while we can point to splendid and substantial results attending their labours, the value of such auxiliaries to the gas manager is not sufficiently recognized nor generally acted upon. As was remarked by Mr. Newbigging at the recent meeting of the Manchester District Institution of Gas Engineers, at Rochdale (see *ante*, p. 429), "a chemist should be employed at all sufficiently large works—at all those where they could afford to pay him for his labour—not merely for testing whether the oxide was spent and whether there was only a certain quantity of sulphur in the gas, but for the purpose of research."

It may be desirable and instructive to indicate here a few of the problems remaining unsolved, to which chemical research may fitly be directed, with hope of receiving adequate reward. First, with regard to the raw material of gas making. How little is known of the actual constitution of coal itself. In what forms and combinations are its elementary constituents united? For it is admitted without question that its elements are combined in some specific forms, and not existing in mere haphazard conglomeration. Doubtless, for example, its carbon and hydrogen exist to some extent in the form of definite compounds, which if we did but clearly know, might further us immeasurably in our efforts to produce from them other and more desirable combinations of the same elements. The oxygen also contained in the coal. How is it combined, and what determines the different combinations in which it appears in the products of distillation? It has been shewn by several investigators that the proportion of carbonic acid and of carbonic oxide found in the gas increases with the quantity of oxygen contained in the coal; while, on the other hand, the hydrogen and marsh gas decrease as the oxygen increases. But while this may be a sufficiently near approximation to the truth, it does not always hold good. And it is further to be noted (what is, indeed, of greater practical importance) that of two coals containing approximately equal amounts of oxygen, and carbonized under exactly similar conditions, the one may yield much more carbonic oxide and less carbonic acid than the other. It is obvious that to the gas maker the former coal would, *cæteris paribus*, be a more valuable gas-making material than the latter. Then there is the question of the oxygenated products found in liquid and tarry distillates. For instance, if instead of benzol and its homologues remaining in the gas, we get phenol and cresols dissolved in the tar, the value of the products of distillation is, from the gas manufacturer's standpoint, seriously reduced. Clearly we require, not only to exercise discrimination in the selection of the raw material of gas making, but also to discover and more fully develop selective processes of manufacture.

The mention of tar suggests the remark that the formation of the secondary products of gas manufacture—the *residual* products of earlier days—is a subject worthy of extended study. With regard to ammonia, according to the researches of Professor W. Foster, of the total nitrogen existing in the coal put into the retort, not more than 15 per cent. is represented in the ammonia recovered; while more than twice that amount goes away as free nitrogen or in other combination in the gaseous products. Cannot some portion at least of the inert nitrogen, which would be better kept out of the gas, be converted into the more valuable commodity? If the whole of the gaseous nitrogen could be recovered in the form of ammonia, the yield per ton of coals would be trebled in amount.

Passing on to other stages in the process of gas manufacture, there is ample scope in connection with condensation, scrubbing, and purification (notwithstanding all the attention that has been bestowed upon these matters) for more complete investigation. Our knowledge of the reactions involved in purification by oxide of iron, and the subsequent revivification of the spent material, is far from complete; while the vagaries of lime, in the process of purification from sulphur compounds, are, after all the light shed upon this subject by the researches of Veley and others, still very imperfectly understood. Then there is the recently introduced use of oxygen, and the somewhat older and more general employment of air, to assist purification, as to the rival benefits of which controversy still hotly rages. On the one hand, the users of oxygen declare that by their method they obtain advantages far outweighing the additional cost of purification due to the pure material they employ. On the other, those who employ air profess to get substantially the same benefits, without having to pay anything for their reagent. And so long as we have it asserted that nitrogen—even in very slight amount—cannot be introduced into coal gas without deteriorating its quality to much greater extent than its accompanying oxygen can do good, while, in direct contradiction thereto, air is being regularly employed in many gas-works to the extent of 3 per cent. or even more upon the total quantity of gas made—it cannot be said that the subject of the influence of diluents has been thoroughly thrashed out.

Other chemical problems still awaiting solution, after years of persistent attack, are: The cause and prevention of stoppages in ascension pipes; the naphthalene question—whether it can be usefully retained in the gas, to increase its illuminating value, or must be eliminated therefrom before unpleasantly revealing itself in troublesome obstructions; the purification of gas in closed vessels, by means of its own ammonia; the conversion of tar into permanent gas, and the corresponding problem of the improvement of coal gas by admixture with oil gas or carburetted water gas. In working out the last-mentioned, considerable

activity has been recently displayed; and it would seem that we are within near prospect of witnessing radical changes in the ordinary methods of gas manufacture. Then there is the question of the illuminating value of the different constituents of purified coal gas, with regard to which much has been done but more remains to be done. For example, it has been shown by Dr. Percy Frankland that, of the combustible diluents, marsh gas is much more valuable in developing the illuminating power of the heavy hydrocarbons than is hydrogen, and hydrogen than carbonic oxide; while quite a new light has been shed on the illuminating constituents by the recent discovery of Professor Lewes that it is primarily to the combustion of acetylene—either previously existing in the gas, or formed from other hydrocarbons by pyrogenous reactions within the flame itself—that the illuminating power is due. This suggests yet another subject for enquiry: The relation of the heat afforded by a flame, and of the mode of its combustion, to the illuminating power developed. It has been shown that of the total heat developed in an ordinary gas-flame, something less than 2 per cent. is all that appears as luminous rays—a duty which is somewhat improved upon by regenerative burners. But a matter worthy of notice in this connection is the fact, which has been many times attested, that a mixture of coal gas with carburetted water gas gives a gas possessing decidedly higher illuminating power than is given by either of the two gases separately, which would go to prove that the development of light by a gas-flame is something more than a mere question of so much carbon and so much heat developed in combustion—the combustion of the mixed gases being probably altered to some extent in character rather than in degree.

Sufficient has been advanced to show the scope there exists for well-directed chemical knowledge in the solution of practical problems of gas manufacture and combustion.

Belgian Association of Gas Managers.—Owing to the discontinuance of the grant made by the Brussels Municipality to the above-named Association, towards the expenses of maintaining the exhibition of gas appliances at their rooms on the Boulevard du Nord, it was decided to close the exhibition—only temporarily, however, until a suitable place could be found for re-opening it, and carrying on the general work of the Society. We learn that this has now been secured in a more central part of the city, at No. 111, Boulevard Anspach.

Presentation to Mr. J. Greenaway.—A copy of the *Montreal Daily Witness* for the 13th ult., just to hand, contains the following paragraph: "Mr. James Greenaway, Superintendent of the Montreal Gas-Works, at Hochelaga, has been presented with a handsome gold-headed cane and an illuminated address. The presentation was made by the employees of the Company under his charge; the occasion being the celebration of Mr. Greenaway's fiftieth birthday. The occasion was seized by a host of friends; and Mr. Greenaway has been inundated with presents and marks of the affectionate esteem in which he is held by all who know him."

The Insurance of Gas-Works.—About a month ago, a fire was discovered to have broken out in one of the coal-stores at the Croydon Gas-Works, which at the time contained between 3000 and 4000 tons of coal purchased during the Durham strike. This was the first time that any difficulty of the kind had been experienced by the Company. Before the various fires could be extinguished, and danger of a serious conflagration averted, the whole of the coal had to be removed. Curiously enough, the Directors had for some few months previously had under consideration the question of the insurance of the works, including the store of coal, against damage by fire; and arrangements were entered into with the Royal Exchange Assurance Company. The details were only completed a few days prior to the outbreak; and it is satisfactory to learn that the Company have met the claim in a very fair and straightforward manner.

Coal in Vancouver Island.—The United States Consul at Victoria, in a recent report on British Columbia, mentions that coal is one of the chief products of the province; the export in 1888 and the three succeeding years having been two-fifths of the total exports. Both anthracite and bituminous coal have been found in many parts of the province. Veins of lignite exist near New Westminster, and along the Thompson and Skeena rivers; bituminous coal has been found near Kamloops, and deposits of semi-anthracite of good quality are now being worked in the East Kootenay district. In Graham Island, one of the Queen Charlotte Islands, "a compact and brilliant anthracite" is being worked by companies of American and Victorian capitalists; but it is on Vancouver Island that coal mining has been most developed. The coal-fields there are described as of unlimited extent; and new discoveries are being made every year. At present the deposits worked are on the east coast, along Georgia Straits. Nanaimo is the centre of the coal trade of the island; and four large collieries are in operation near it. The veins generally lie horizontally, and vary in thickness from 2½ to 11 feet. The working is by vertical shafts from 200 to 690 feet in depth. The class of coal obtained is semi-bituminous, of fine quality. It has higher heating power, and bears transportation better, than most of the coals found west of the Rocky Mountains. The statistics given in the report show that, while the total production in 1874 was 81,000 tons, it was 394,000 tons in 1884, and 1,029,097 tons in 1891.

TECHNICAL RECORD.

MIDLAND ASSOCIATION OF GAS MANAGERS.

The Quarterly Meeting of this Association was held at the Grand Hotel, Birmingham, last Thursday—Mr. W. Littlewood, of West Bromwich (the President), in the chair.

New Member.

The name of Mr. Adam Cooke, of the Oldbury Gas-Works, was submitted for election; and on the motion of Mr. C. Meiklejohn (the Honorary Secretary), seconded by Mr. Charles Hunt, he was duly elected.

Papers and Discussions.

A discussion took place on the paper read by Mr. H. Hack at the autumn meeting last year, on "Elliott's Process of Continuous Carbonizing."* A paper was afterwards read by Mr. T. B. Jones (Willenhall) on "Stopped Ascension-Pipes: Their Cause and Cure." This will be found in another column. A discussion followed, a report of which, as well as that on Mr. Hack's paper, will appear in a subsequent issue.

Election of Officers.

The President said it afforded him very much pleasure to propose his successor in the chair. He was sure that, when the members heard the name he should mention, they would all agree that he was very worthy to fill the position. He proposed that Mr. B. W. Smith, of Smethwick, be elected President; and he sincerely hoped he would have a successful year of office.

Mr. H. Hack (Saltley, Birmingham) said he had very much pleasure in seconding the motion, particularly so because, as perhaps the members knew, Mr. Smith was at one time engaged as his assistant at the Saltley works; and he rendered him very great help there. He had watched with close attention Mr. Smith's progress since he left Saltley to occupy the position of Engineer and Manager of the Smethwick Gas-Works; and the clever way in which he had conducted the works, under many difficulties, was one reason why he felt he was qualified to hold the office they were about to confer. He had been very regular in his attendance at their meetings; and on one or more occasions he had contributed valuable papers. He wished him a happy year for his presidency.

The motion was carried with acclamation.

Mr. Smith said he felt very deeply the honour conferred upon him; and he trusted that, in any efforts he might make to promote the success of the Association in the coming year, the members would all give him that help which they had in the past accorded to the other Presidents.

Mr. Hunt proposed the re-election as Treasurer of their esteemed and worthy friend, Mr. Simpson. It was not the first time he had had this pleasure; and he hoped Mr. Simpson would continue to hold the position for many years to come.

Mr. J. S. Reeves (Bilston) seconded the motion; and it was carried.

Mr. Simpson said he had on many occasions had to return the members his hearty thanks for appointing him Treasurer. He now felt more attached than ever to the Association; and he should regard it as an honour to continue to serve them. He afterwards proposed the re-election of the Honorary Secretary (Mr. C. Meiklejohn). He said they had had good proof of the way in which he discharged his duties; and he hoped they would take a hint he had given as to answering his communications, when he invited papers or wrote on other subjects.

Mr. J. C. Belton (Wellington) seconded the motion, and it was carried.

Mr. Meiklejohn, in acknowledging his re-election, said he wished to do all he could for the Association. He reminded the members that, although it might not seem important to them to reply to the circulars he issued, it was a matter of much concern to himself.

Mr. Simpson proposed, as members of the Committee, Messrs. Hulse and Belton, in place of the retiring members, Mr. Hunt and Mr. Reeves, who were not eligible for re-election.

Mr. Hunt seconded the motion, which was agreed to.

On the motion of Mr. R. O. Paterson (Cheltenham), seconded by Mr. J. F. Bell (Stafford), Mr. C. Dakin and Mr. J. Brookes were elected Auditors.

Vote of Thanks to the President.

Mr. Hunt next proposed a vote of thanks to the retiring President. He said the members would all agree that, throughout a year of almost exceptional difficulty, Mr. Littlewood had, while acting at the head of affairs, carried them on to their entire satisfaction; and their best thanks were due to him for his conduct during his term of office.

Mr. Smith (the President-Elect), in seconding the motion, endorsed Mr. Hunt's remarks.

The motion having been carried with applause,

The President returned thanks for the vote. He said that, in taking the position of President in the past year, he did so with some diffidence. If the members were satisfied with his services, he was grateful to them.

Presentation to Mr. Simpson.

The President said they wished now to make a presentation to Mr. Simpson, on his retirement from active duty; and he

* See Journal, Vol. LVIII., p. 755.

would call upon Mr. Hunt—one of the oldest members of the Association, and an old friend of Mr. Simpson—to present the silver salver and cup on the table before them.

Mr. HUNT: I esteem it a very great privilege to be called upon, as one of the oldest members of the Association, to give expression to our feelings on this occasion towards our old friend and fellow-member, Mr. Peter Simpson. At the same time, I cannot but be conscious how inadequately it is in my power to do justice to those feelings. But, however imperfectly I may express myself, I yield to no one in my appreciation of Mr. Simpson's good qualities. Mr. Simpson has been a member of this Association from its formation. He has filled the chair; and for years he has held the office of Treasurer, to our great satisfaction and advantage. His presidential year was marked by a most hospitable reception of the Association at Rugby, which those who were fortunate enough to participate in will not readily forget. That hospitality he has very recently and most generously repeated; besides indicating in other ways his entire devotion to the interests of the Association. Of his professional ability, I need say but little. His 38 years' record at Rugby, and the prosperity of the Company which was fortunate enough for so many years to command his services, speak more eloquently in his praise than any words of mine can do. At our recent meeting at Rugby, Mr. Simpson gave us some figures showing the growth of the undertaking during his management; and these must have set many of us wondering at the means by which so great a growth could be so quietly accomplished. I do not pretend to be in full possession of Mr. Simpson's secret; but I may perhaps be able to throw some little light upon his methods. When preparing my Inaugural Address to The Gas Institute (then the British Association of Gas Managers) in 1880, I ventured to issue a circular of inquiry. I do not believe in these circulars as a rule, and am not very often guilty of employing such "instruments of torture." But on this occasion I was desirous of gaining information as to the usual method of treating new customers, as bearing upon the popularity or other wise of the use of gas. With your permission, I will read an extract from my address:

> "Again, in one small non-manufacturing town, not included, on account of its size, with those I have just referred to, there is a percentage of consumers of 70, and a consumption per head of population of 3500 cubic feet, in striking contrast with a manufacturing town more than twelve times its size, in which the percentage is only 34, and the consumption 2500 cubic feet. I do not know what may occur to you as a reasonable explanation of such an anomalous condition of things; but I believe that I am in possession of a sufficient, although by no means a satisfactory one. The fourth question in my circular was, 'What is your rule with regard to deposits or guarantees?' and the answer to this from the smaller of these two towns is eminently simple and straightforward, 'No deposit or guarantee.'"

You may perhaps have been wondering what this has to do with the matter in hand; but when I tell you that the small non-manufacturing town was Rugby; and that the simple and straightforward answer of "No deposit or guarantee" was given by our friend Mr. Simpson, the drift of my reference will be apparent. Without going so far as to assert the applicability of his system under all conditions and in all circumstances, there can, I think, be little doubt that the liberal policy pursued in this respect by Mr. Simpson has contributed largely to the success of his Company, and to the increase of consumption and high percentage of consumers in proportion to tenements, which it has enjoyed. I know there are some who think we should be as well or better off without increased consumption. But such is not my opinion; neither can I believe it to be yours. We can no more afford to stand still than any other industry can. The industry which is not an increasing one is either retrograding or trembling in the balance; and it will be a bad day for the gas industry when there are no increases of consumption to report. I have touched briefly upon the merits of our friend, as manifested in what may be called his public career; but these do not constitute his sole, nor indeed his principal, claim to our regard. What we value most of all in him are those virtues which usually shine most conspicuously in private life and in social intercourse—his transparent sincerity and warm-heartedness, his geniality, and the readiness with which he has at all times placed at the service of the members the fruits of his long and ripe experience. Feeling, then, as we do towards him, not only as an old and valued member of this Association; not only as one who has been a notable figure in the ranks of his profession; but above all as a very old and dear friend—we could not let this occasion of his retirement from active service pass without recording our sense of his worth, and wishing him enjoyment of his well-earned leisure, long life, health, and happiness. It would not have been possible for us to fill up, by any offering we could make, the full measure of our esteem; but it has been deemed fitting to mark the occasion by a presentation which may at least serve as a not unpleasing reminder of it. It is our purpose, Mr. Simpson, to ask your acceptance of an album containing an illuminated address, with the signatures of the subscribers, as soon as this can be prepared. In the meantime, we hope you will accept of this salver and this antique cup. Each time that you use the cup, may its contents be exalted, by the memories that it awakens, into "beverage fit for the gods."

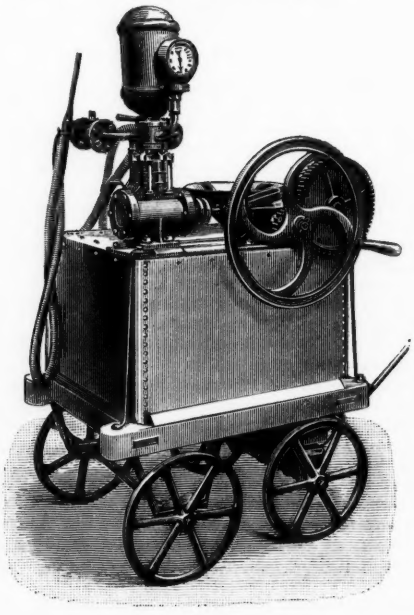
[The salver, which was very chastely engraved, and weighed about 70 oz., bore the following inscription: "Presented, together with an antique silver cup, to Peter Simpson, Esq., by the members of the Midland Association of Gas Managers, on his retirement from active work, as a token of their respect and esteem, and in recognition of his services as Hon. Treasurer of the Association for eleven years. October 27th, 1892." The cup, the date of which was 1757, had engraved thereon the date of presentation.]

Mr. SIMPSON, in reply, said that if Mr. Hunt felt embarrassed at having such a presentation to make, what must his own be in acknowledging it? What had he done to merit such kindness? He trusted at least he had done, and he had intended to do, all he could to advance their profession. A long speech they must not expect from him; but he must just say how pleased he was to meet them, and to receive such marks of their good feeling towards him. He thought the Midland Association was an honour to the profession; and he had long felt highly and deeply attached to it—not that he had anything to do with its formation, for he believed their friends Mr. Hunt and Mr. Tyndall, took the most prominent part in originating it. He was pleased to think that it was second to no other Association; and he hoped the members would all, with the help of their excellent Secretary, strive to further its objects. In the Association he had been more a scholar than a teacher. He had tried to learn, and had learnt a good deal; and he had always been willing himself to impart all he knew to those who wished for his opinion. He was extremely obliged to the members for their kindness; and he only wished he deserved what they had given to him. As to what Mr. Hunt had said about the drink of the gods, he knew nothing. (Laughter.) But he did know this—that, if he drank out of that cup, it would excite very pleasant remembrances; and he thanked them all heartily for it.

The proceedings then terminated, and the members afterwards dined together.

HERRING'S COMPRESSED FLUID CARBURETTER.

Our readers may remember that, at the meeting of the Southern District Association of Gas Engineers and Managers in November, 1890, an important discussion took place on a paper read by Mr. Frank Livesey on "A Ready Means of Enriching Coal Gas." In the course thereof, Mr. R. Herring, of Dover, referred to some experiments he had been making with paraffin oil as an enricher, which, he said, had been attended by economical results. He promised to lay before the members, on a future occasion, some particulars in regard to his system; and this he did at the meeting of the Association in London last year. By way of completing the information then supplied, we give below an illustration of one of Mr. Herring's carburetters (two forms of which are made), with some details as to its operation which he has forwarded to us.



The appliance consists of a tank, fitted with a float for indicating the quantity of fluid used. Mounted on the tank is a pump, by which the oil or spirit is forced into a compressing chamber; the amount of compression being indicated by means of a gauge. Attached to the outlet of this vessel is a ¾-inch flexible hose, furnished with a sprayer. The method of working is as follows: Oil or spirit is put into the tank, and the pump set to work until a pressure of 40 or 50 lbs. per square inch is shown by the gauge. The fluid is then ready for spraying, which is effected by simply opening the stopcock communicating with the hose. The time usually occupied in spraying is 20 seconds per retort; the quantity of fluid ejected being two pints. After a few minutes' interval, the operation can be repeated in the same retort.

The extent and frequency of the spraying will, of course, depend entirely upon the amount of enrichment desired. When the oil or spirit is released from the compressing chamber, it expands rapidly in the flexible hose, until it is checked by the small aperture, about $\frac{1}{32}$ of an inch in diameter, in the sprayer. This thoroughly breaks up the oil, which is converted into a fine spray, and brought into the best possible condition for gas-making purposes. The end of the sprayer attached to the hose-pipe is conical in shape; and, when in position, it makes a sufficiently gas-tight joint for practical working. No special fittings are required on the retort-lids, as ordinary $\frac{3}{4}$-inch cocks answer very well. These should be placed in such a position that the fluid passes clear over the charge of coal into the centre of the retort. For large works, power pumps would, Mr. Herring says, be more economical, as they could be located in any convenient spot, and the fluid distributed in the retort-house by special pipes fitted at suitable distances with flexible metallic hose, long enough to work over several beds. The carburetter shown in the above illustration is one of the larger type, and is double-acting throughout; the smaller machine being single-acting, and fitted with one sprayer. The tank capacity is 45 gallons in the former, and 20 gallons in the latter. The inventor claims for his appliance, that its working parts are few, and free from complication, and therefore not liable to get out of order; further that it has been proved, by two years' practical working, to be an easily-manipulated, reliable, and economical adjunct to the retort-house. At the Dover Gas-Works, where it has been in use, the average quantity of oil employed per ton of coal was one gallon, costing 4½d. delivered on the works. The expense of spraying being ½d. per ton, the total cost for material and labour for enrichment is 5d. per ton. Actual working results for the six months to June 30 last show that it never exceeded 6d. The effect of the operation is shown by the photometrical tests, which, Mr. Herring says, give 14·87 candles for gas made from coal alone, as compared with 16·09 candles for that produced from coal and sprayed oil; being an increase of 1·22 candles. In order to compete with oil as an enricher, high-class cannel should, he adds, not cost at Dover more than 23s. per ton on the works.

STOPPED ASCENSION-PIPES: THEIR CAUSE AND CURE.

A Paper read by Mr. T. B. Jones, of Willenhall, before the Midland Association of Gas Managers, Thursday, Oct. 27, 1892.

I felt I could not refuse the kind invitation of our Honorary Secretary to do something for our Association—something to make our meetings useful as well as attractive. The question, however, that presented itself to my mind was, what subject shall I take up, as the whole ground has been traversed so many times before that I felt I could add nothing new to what has been said, and said in a much better manner than I could expect or hope to do. Still, I thought perhaps my own experience and observations on the above-named subject might prove useful and bring about a good discussion, and at the same time be of service to many. But seeing this is my maiden effort in this direction, I trust you will kindly extend to me the customary forbearance under such circumstances.

Of course, the question of stopped ascension-pipes is nothing new, as many present know to their cost, though I have heard of managers who say they never knew what a stopped ascension-pipe meant. In that case, I may venture to remark, their heats are low, the dips heavily sealed, and the make per ton of coal carbonized not good. This subject has engaged the minds and attentions of managers, in this country, America, and elsewhere, ever since the introduction of gas lighting; and I am not sure that anything of importance has been added to our common stock of information for the last twenty years. Consequently, I think I need offer no apology for taking up a subject which has received as much attention as, if not more than, many of the other subjects we as managers have to contend with, yet without having arrived at any very definite results.

I do not think it necessary to burden my paper, and weary you, with all the schemes that have been put into practice to overcome this trouble; but I may be pardoned if I mention a few of them. We are all acquainted with the last shovelful of damp coal placed on the mouthpiece; the old pot of water or fat placed just inside the mouthpiece; the trickling of cold water down the ascension-pipe both inside and out; the casting of the first length of the ascension-pipe with a water-jacket, causing a stream of water under pressure to circulate around, and pass off above, and so keep the ascension-pipe cold; the introduction of light steel pipes in the place of the rough uneven cast pipes; making the mouthpiece longer, and so causing the ascension-pipe to stand farther away from the front of the sets, and heightening it; the building of thick walls to the front of the settings; and, finally, Mr. Eveson's patent compound, which we are assured is an infallible cure for stopped pipes.

Like the quack one sometimes sees in our small market towns, I have another preventative, which I, of course, consider better than any of those mentioned; and, though I have reason to think something on the same lines has been tried before, still I claim to be the first to introduce, in a workable form, a perforated drum. It is now something like twenty years ago since we were troubled very much with stopped ascension-pipes at the Ebbw Vale Gas-Works, where we worked with high heats. I suggested to my father (who was then Manager there) that we should introduce a light wrought-iron drum, thickly perforated with holes on all sides; and I attempted to prove to him the benefits that would most assuredly arise from the use of such an apparatus placed in the mouthpieces, just beyond the gas outlet. It was all to no purpose, for my respected parent would have none of it. It was not until last winter, when driven to my wit's end with stopped ascension-pipes, that I was determined to put into practice my old hobby; and this, I am glad to tell you, proved far more successful than I had ever anticipated. At Willenhall, I may mention, our hydraulic mains are three in number; two of them being 43 feet each in length, and the third 33 feet. Now, you will be better able to follow me, and see how difficult it is to do good work under such circumstances, when I tell you that, in going through the matter of levelling these mains a few months ago, we found that the first one of 43 feet was as much as 1¾ inches out of level—the middle of the main being up, and the two ends low. The second of the same length had gone down in the middle, owing to subsidence of the foundations by 1¼ inches; so that in this case the middle of the main was down, and the two ends up. This caused a good many of the dips to be only lightly sealed, while others were equally heavy; and so I found that the light-sealed dips had brought about the mischief. To improve matters, my stokers positively refused to go on the top of the beds, contending that it was no part of their duty to jump pipes, although they had always attended to these matters before the adoption of the eight-hour shift. It was when I found the stokers thus indifferent to stopped pipes, that I felt something must be done, as the expense of keeping yard labourers to do the work was too much to entertain.

We are told, and I know that among many managers a strong belief exists, that the trouble of stopped pipes arises from certain kinds of coal; but I cannot say that I am one of them. All my experience tends to show that the trouble is not so much in the coal as in the high heats and the uneven seals in the hydraulic main, or when working anti-dips, although opinions upon this theory are widely divergent. But to proceed, I will here describe briefly my perforated drum (or disc), though I may say that I have not finally resolved upon the internal construction of the drum. At present, the drum is made of light sheet iron, thickly perforated on all sides with holes, and about 9 to 10 inches deep, made slightly less than the diameter of the mouthpiece, to allow for expansion and freedom of working when putting in or taking out, and also tapering a little. As before mentioned, it is placed in the mouthpiece just beyond the gas outlet. Now, with regard to its action. It will be apparent to all that the drum thus acts as a kind of hollow partition splitting up into numerous streams the gas as it is made, and preventing it from directly impinging upon the mouthpiece. By this means, I find the high temperature of the mouthpiece and ascension-pipe is reduced in a most marked degree; and by the free use of the drum in the way described, it effectually overcomes the difficulty of stopped pipes, and the formation of thick tar in the hydraulic main. This, of course, is a very simple arrangement; and there is no scope for any elaborate description of details. But, as a rule, simplicity of action gives rise to more genuine and lasting results than very complicated mechanism; and often the simplicity of the agent astonishes one that it has not been found out or tried previously, especially when one sees the great changes that frequently follow from an apparently trifling idea.

I do not claim for this invention or cure that, if the ascension-pipe is stopped up already, the drum will clear it. No! "Prevention is better than cure," even with regard to this matter; and the usual method of clearing must first of all be gone through—that is, the auger has to be introduced, and a small passage made. Then, by the continued use of the drum, the pipes will be kept perfectly free. Perhaps the first thought that naturally strikes one is the trouble of always inserting the drum. But, on the other hand, it does away altogether with the heavy labour of jumping pipes, to say nothing of the loss and annoyance of the pipes being stopped. By the light labour of the insertion of the drum, it is a clear saving of labour, and will be recognized as such by the stoker after a fair trial. The results, too, that are, and can be, obtained from the continued use of the drum, were to myself somewhat surprising, and opened up to my view quite a field of inquiry.

I will now proceed to enumerate some of the advantages realized by the drum, and will deal with them *seriatim:* (1) It prevents any stoppage in the ascension-pipes, and leaves them perfectly clear; and I may say here that this broad statement of fact is the result of my own personal experience from at least twelve months' steady working, and a careful and incessant experiment upon, and study of, the question. (2) It naturally follows that, as the pipes are kept open by the drum, a decided improvement in the make of gas is effected. This, too, I have verified to my own satisfaction, and am able to give statistics in proof, which, I trust, will demonstrate the fact to you. For instance, I have taken, as a simple illustration, the carbonizing account for the months of September, 1891 and 1892—with the same amount of coal carbonized—with the drum in and without it (though any other month would show the same result). In September, 1891, the quantity of coal used was 317 tons, and the amount of gas made 3,195,000 cubic

feet; while in September, 1892, from the same quantity of coal, 3,392,000 cubic feet were made—being an increase of 196,000 cubic feet, which is equal to 6 per cent. (3) I find that, when the drums are in use, the heat is retained more in the retorts, and consequently better working heats are obtained. The coal, too, being more thoroughly carbonized, and also carbonized *close up* to the mouthpiece, a brighter, firmer, and more saleable quality of coke in every way is produced. Besides, the coke in the front of the retort is as good as that in any other part, with less small in it after being thrown down or stacked.

By drilling holes in the mouthpiece and ascension-pipe, and taking readings of the temperature by the aid of one of Bailey's improved adjustable pyrometers, I am able to give you the following average results of extended hourly readings with and without the drum in use. For instance, I took a bed of retorts that are at what I consider a "good heat," and found, on taking the readings at the end of each hour from the time the charge was put in, the average reading was 427° Fahr. I took the readings in this way: The holes were all 1 inch in diameter; and, in the case of the mouthpiece, it was made on the side about 10 inches from the lid. The hourly readings in the order taken were as follows: 510°, 375°, 250°, 525°, and 475°; or, as stated above, an average of 427°. The second hole was made in the ascension-pipe 2 feet from the centre of the retort; and the average at this point stood at 290° for five hourly readings. I have the hourly readings by me, if members wish to know them; but I leave them out for simplification. The third hole was made still higher up in the ascension-pipe—viz., 5½ feet from centre of mouthpiece. The average readings at this point were 240°. All these readings are without the drum.

I will now give the average results of many readings of temperature made in a similar manner, but with the drum at work; and you will kindly note the figures, which are, under the circumstances, very interesting. The average heat at the hole in the mouthpiece (the same distance in every case as mentioned above) was 478°, or an increase of 50°. The five hourly readings were: 510°, 525°, 430°, 475°, and 450°. The average for the second hole (which, you will remember, was 2 feet from the centre of the retort) was only 242°, or a decrease of nearly 50° as compared with the readings at the same point without the drum; while the average reading at the third hole in the ascension-pipe (which was 5½ feet from the centre of the retort mouthpiece) was only 131°, or a remarkable decrease of nearly 110°. The mouthpiece readings prove conclusively to my mind the opinion I have formed, and which is the statement I have previously made—viz., that the internal heats of the retorts with the drum at work were higher; while the low readings of the ascension-pipe confirmed most conclusively my earlier experience and ideas that the temperature of the ascensions was decreased, and that this was the agency that prevented the drying up of those elements in the crude gas, during the passage to the hydraulic main, which, with the higher temperatures that exist in the ascensions under ordinary circumstances, is the principal cause, in my opinion, of the great inconvenience and loss in stopped pipes.

	Without Drums.			With Drums.		
Hours in Use.	Temperature at Mouthpiece.	Temperature in Ascension-Pipe.		Temperature at Mouthpiece.	Temperature in Ascension-Pipe.	
		1st Hole.	2nd Hole.		1st Hole.	2nd Hole.
1	510°	475° ..	465°	510°	285° ..	160°
2	375°	325° ..	275°	525°	275° ..	180°
3	250°	200° ..	170°	430°	250° ..	140°
4	325°	225° ..	140°	475°	250° ..	100°
5	475°	225° ..	150°	450°	150° ..	75°
—	2135°	1450° ..	1200°	2390°	1210° ..	655°
Averages	427°	290° ..	240°	478°	242° ..	131°

Average difference in temperature with drums: At mouthpiece, + 49°; at first hole in ascension-pipe, − 48°; at second ditto, − 109°.

In addition to the advantages already mentioned as resulting from the use of the drum, there is another which I was quick to notice, and careful trials proved its correctness—(4) That there is a saving in the fuel account. I will instance this. My fuel account stands at 30 lbs. of coke per 100 lbs. of coal carbonized, which is not high, when you take into consideration that our settings consist of 16-inch and 15-inch retorts, in beds of fives, with only 2 cwt. charges. This account I was able to reduce during a whole week's test to 23 lbs. per 100 lbs. of coal carbonized, or equal to 7 per cent. With this amount of fuel used, I was compelled, owing to the increased heats, to work with less draught. A still further benefit is (5) that there are less signs of any approach to scurf or carbon in the retorts; and the illuminating power of the gas is well maintained.

In conclusion, gentlemen, I now leave this matter in your hands for your kindly criticism; and if I have, through inexperience, not made myself clear, I shall be glad to reply to the extent of my ability to any question that may arise. If any members would care to see the drums at work at any time, I shall be only too pleased to meet them at Willenhall, as well as to give any information they may require with regard to a question that has proved so beneficial to myself, and that has given me so much pleasure and many surprises while carrying out my experiments, under difficulties, to a measure of success that I did not dream of; and nothing can diminish my opinion as to the value and practicability of the drum, as it has been firmly fixed in my mind by the twin teachers Experiment and Experience.

[Mr. Jones asks us to state that he has applied for a patent for his arrangement, as described in the foregoing paper—No. 13,470; July 23, 1892.]

REGISTER OF PATENTS.

Gas-Engines.—Robinson, H., of Manchester. No. 20,262; Nov. 21, 1891.

This invention relates to various details in engines in which the piston is propelled by the explosion and expansion of a mixture of gas or combustible vapour and air or other supporter of combustion.

To actuate the valves of the engine, the exhaust-valve may be operated by a cam or eccentric upon the engine-shaft; a rod from the eccentric or cam actuating a wheel with various sizes of teeth, which throw the rod into and out of position for actuating the exhaust in the manner described in patents No. 14,787 of 1890 and No. 1083 of 1891. The speed of the engine may be governed by the catch, or detent, or tongue-piece pivoted on the exhaust-valve stem or prolongation in such a manner that, when the exhaust is open, the tongue-piece comes against a stop, which moves it into such a position that it would come in contact with another stop during the early part of the action which would otherwise close the exhaust. A spring, or gravity, or their equivalent tends to move the tongue-piece into such a position that it will miss the last-named stop when the engine is running at or below its normal speed; thus allowing the exhaust to close. Should the engine run above its normal speed, the tongue-piece has not time to get into position to miss the stop; and the exhaust is not allowed to close as described in the 1891 patent. The inlet-valve for the admission of the charge may be of the mushroom type—the air entering at the centre, and the gas or vapour through a number of small holes, from an annular space suitably formed.

The air-inlet opening may be prolonged preferably by means of a pipe-shaped piece, which can be taken off to adjust the valve; and within this pipe-shaped piece-cotton waste, or other substance having the same property of absorbing sound, may be placed—the object being to prevent or lessen the sound caused by the inflow of air to the cylinder. The cotton waste may be kept in place by discs of wire gauze, through which the air can pass. The patentee prefers the air to pass in an annular film round the quieting material, which may be contained in a small cylindrical case with gauze ends. The inlet-valve and quieting-device are placed preferably behind the exhaust-valve.

Several other details are described, among others the following: To diminish the sound of the exhaust products of combustion, they are caused to pass through a quantity of fine wire (preferably tinned iron wire) of about No. 36 gauge. The wire may be placed in the exhaust-pipe, which may be enlarged to receive it; or a hood or enlarged tube with the wire in it may be placed over the exhaust-pipe, and perforated for the escape of the exhaust products. The wire may preferably be tangled, by cutting the coils through, and thus dividing it into lengths which easily tangle, as tangled wire lessens the sound.

Manufacturing Producer and Water Gas.—Jabs, A., of Wyhlen, Baden, Germany. No. 20,780; Nov. 28, 1891.

This invention relates to a method of generating producer gas, wherein the solid fuel which is to be converted into gas is mixed with incombustible or refractory material, so that, on feeding such mixture into the upper end of a gas-producer, the incombustible material has the effect of producing such an extension of the reducing zone as to secure the complete reduction of the carbonic acid generated in the combustion zone.

With the ordinary arrangement and working of a gas-producer, remarks the patentee, practice has shown that it is unavoidable that a portion of the carbonic acid gas first formed flows away without being reduced, and passes off together with the carbonic oxide, which fact greatly diminishes the heating powers of the producer and water gas. The cause of this imperfect reduction of the carbonic acid formed in the lowest zone is that the extent of the reducing zone is comparatively small; and consequently a certain proportion of the carbonic acid has not sufficient time to come in contact with the carbonaceous material that should effect its reduction. It has, however, not been possible to give to the reducing zone the required extension, because the reduction of the carbonic acid involves a very considerable absorption of heat (about 69,000 calories); so that only those layers of fuel can be maintained at a sufficiently high temperature for effecting reduction which are immediately above the oxidizing zone, and which are maintained at incandescence temperature by conduction and radiation of heat from the freshly-produced highly heated carbonic acid. With increasing distance from the oxidizing zone, the temperature sinks very quickly in the reducing zone, owing to the rapidly decreasing action of the heat radiation and conduction, and the heat absorption caused by the reduction; so that, with most constructions of producers, the reducing action ceases at a height of a few decimetres above the combustion zone, and the preliminary heating zone there commences.

The present invention has for its object to diminish this defect. It consists in mixing with the fuel that is supplied to the producer, incombustible materials—such as fire-clay, lumps of porcelain, burnt clay, &c. The fuel will then become consumed by degrees as it descends; so that, in the lower part of the producer, only the added refractory material will exist, which will have been highly heated in the combustion zone above, and will transfer this heat to the incoming air supply. By this means a moving store of heat is as it were created—consisting of lumps of fire-clay, porcelain, or other refractory material—which is fed, together with the fuel, into the top of the furnace, and sinks down according as the fuel burns away or is gasified, and is withdrawn at the bottom together with the ashes, in order to be again

ntroduced at the top, where it takes up the heat from the escaping gases, and again gives off heat to the incoming air or gases as it sinks to the bottom.

The proportion of fuel in the charge consequently gradually decreases in the direction from top to bottom; and in consequence of the large proportion of refractory material, there will be a considerable extension of the oxidizing and, in particular, of the reducing zone, so that the carbonic acid formed in the lower part of the producer, has ample time to become reduced to carbonic oxide, by coming into immediate contact with the upper layers of highly-heated fuel. Of great importance is the fact that, in the mixing of the fuel with the refractory material in the manner described, the working of the apparatus is altered from that of ordinary producers in so far that, in the new arrangement, the action in the reducing zone does not solely consist of the reduction of the carbonic acid produced below, but also simultaneously of an oxidation of fuel by means of the air contained in the gases, which has not entered into combustion in the lower zone. As the fuel becomes gradually consumed as it descends, so that finally only the refractory material remains, the entering air supply first only meets with layers which contain no fuel, and then passes into the combustion zone. The lower part of it contains only very little fuel; so that only a portion of the oxygen contained in the air supply can be used for producing carbonic acid, while the other portion rises up into the upper layers. Thus there will be in the upper part of the combustion zone, and in the lower and middle portion of the reducing zone, a gaseous mixture which does not mostly consist of carbonic oxide and nitrogen, as is ordinarily the case, but which also still contains a large proportion of free oxygen.

This gaseous mixture consequently operates upon the fuel in the reducing zone in two different ways: Firstly, the carbonic acid is reduced to carbonic oxide by combining with the fuel under considerable absorption of heat; and, secondly, a proportion of the fuel—which is large relatively to the quantity of carbonic acid reduced—enters into combination with the oxygen of the air supply under production of considerable heat, so that the heat absorbed by the reduction process is made good again by the simultaneous heat production of the oxidizing process.

In proportion as the gases containing carbonic acid and oxygen rising from the combustion zone ascend higher and higher through the upper layers of the producer, and are rendered gradually richer in carbonic oxide by the simultaneous reaction of the carbon upon the carbonic acid and the oxygen, the temperature of such upper layers will gradually decrease; as, in consequence of the decrease of oxygen, the combustion process will cease, and therefore there will occur in the upper zone only a preliminary heating of the freshly introduced charges of fuel and refractory material, and the consequent disengagement of the volatile constituents of the former.

In this way, the first-mentioned disadvantage of the imperfect reduction of the carbonic acid, owing to the limited extent of the reducing zone, will be avoided, as by the mixing with the fuel of refractory materials in the manner already described, and by the oxidizing process which takes place in the reducing zone, the latter will become considerably extended, so that the carbonic acid rising up out of the combustion zone, as also the uncombined oxygen of the air supply, will have ample time to be converted entirely into carbonic oxide by reaction with the fuel.

The distilling off of the volatile constituents in the upper zone, may, of course, be facilitated by the introduction of a greater or less quantity of steam, according to the nature of the fuel employed.

Preventing Escapes of Gas from Unclosed Burners.—Goldsmitt, G., of Lloyd Square, Clerkenwell, E.C. No. 20,813; Nov. 30, 1891.

The patentee claims the construction of an appliance for preventing the escape or waste of gas from unclosed burners or taps, from which the flow has been stopped and afterwards turned on—consisting of a chamber or barrel, in which a valve is capable of being operated by the pressure of the gas coming from the meter, together with means for retarding the rise of the valve and for stopping the flow of gas when it is turned off at the main and then turned on again; these means being so arranged that they can be controlled from the outside, for the purpose of permitting the gas to flow to the burner when desired.

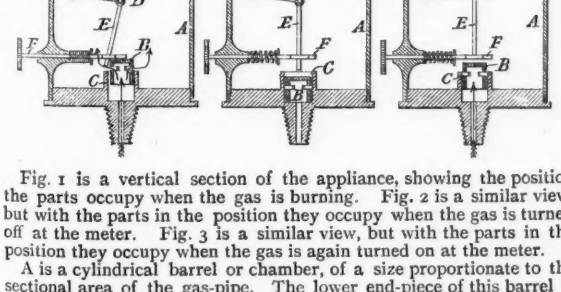


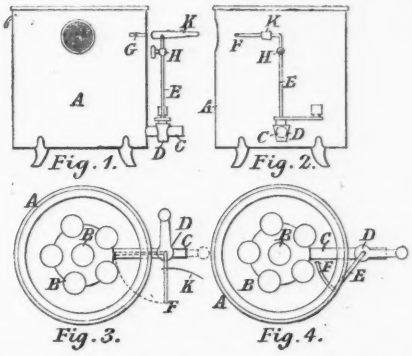
Fig. 1 is a vertical section of the appliance, showing the position the parts occupy when the gas is burning. Fig. 2 is a similar view, but with the parts in the position they occupy when the gas is turned off at the meter. Fig. 3 is a similar view, but with the parts in the position they occupy when the gas is again turned on at the meter.

A is a cylindrical barrel or chamber, of a size proportionate to the sectional area of the gas-pipe. The lower end-piece of this barrel is formed with a tube or socket C, within which is free to slide the cylindrical valve B, having its upper end closed and its circumference formed with slots, ports, or openings. Situated immediately above the valve B, is a pendent-rod E, pivoted to the lower extremity of a short rod carried by the conical plug D. This rod is connected by a cross-rod to a pivot; and it is provided with a stop at its end to limit the downward movement of the plug D and parts in connection therewith. The pendent-rod E rests normally with its end above the valve B; but it can be drawn on one side, and out of the path of the valve B, by means of the spring-controlled rod F, having at its outer end a head and at its inner a loop with which the rod E always engages.

Assuming the parts to be in the position shown by fig. 1—that is to say, when the gas is turned on and burning—it will be seen that a free flow of the gas into the chamber A is given through the ports of the valve B, and to the burner through the conical opening above the plug D. Should the gas now be turned off at the meter, the valve B immediately sinks down into the socket C, and the horizontal rod F is projected forward under the influence of its spring—thereby bringing the end of the rod E above the valve B, as shown in fig. 2. When the gas is now again turned on at the meter, the valve B will be prevented from rising sufficiently high to uncover its ports, by reason of its coming against the rod E. Consequently, no flow of gas can take place into the chamber A; and therefore no gas can escape from the burner until the horizontal rod F is pulled out.

Igniting Gas in Cooking and Heating Stoves.—Fletcher, T., and Clare, A., of Warrington. No. 15,401; Aug. 27, 1892.

The object of this invention is to prevent the risk of explosion when lighting up a gas-stove. For this purpose, it is arranged that the gas can be ignited only by means of a pilot light connected with the gas-supply tap in such a manner that, so long as the gas remains turned on, the pilot light is near the burner, while, when it is turned off, the pilot light is away from it. The gas to the pilot light is not turned on or off by means of the tap supplying the burner, but by an independent one.



In the illustration, A is an enclosed burner chamber (varying in construction with different kinds of apparatus), which is arranged in such a manner that the burners therein are inaccessible for lighting except by means of the pilot light provided for the purpose. B are the burners contained in the enclosed chamber; and C is the gas-supply pipe, controlled by the tap D. E is the supply-pipe for the pilot light F, connected with the tap D in such a manner that it is compelled to move near to the burner when the tap is opened, and away from it when the tap is closed. For the purpose of turning off the supply of gas to the pipe E and the pilot light, when required, there is a tap H in the pipe, the upper part of which is turned in a horizontal direction, and has a burner fixed in its end for the pilot light. As shown by figs. 1 and 2, the upper part of the pilot-light pipe E passes, when the tap D is turned on, through a horizontal slot or opening G, formed in the wall of the burner chamber, and comes into the position indicated by the dotted lines in fig. 3, above and to one side of the burner B; the gas issuing from it being thereby ignited and igniting the gas issuing from the other burners, if more than one be used. On the horizontal part of the pilot-light pipe, there may be fixed a shield K, which, when the pilot light is within the chamber, covers the opening G, and prevents the insertion of a taper, match, or other means for lighting the gas.

In figs. 1, 2, and 3, the gas is represented as being turned off, and the pilot light outside the burner chamber. In the modification represented by fig. 4, the gas is supposed to be turned on; and the pilot light is within the chamber. In this arrangement, the upper part of the pipe E is curved as shown; the centre of curvature being in line with the axis of the tap. With this form for the upper part of the pipe, the pilot light can be passed through a hole not much larger than the pipe itself, instead of through the slot G.

APPLICATIONS FOR LETTERS PATENT.

18,157.—Williamson, T., "Recovery and utilization of waste heat and gases from gas and other furnaces." Oct. 11.

18,210.—Grant, J. J., "Ventilating lamp burners." Oct. 11.

18,238.—Glover, S. and T., and Critchley, J., "A coin-operated device for gas or other meters." Oct. 12.

18,393.—Moore, A. W. B., "Inferential water-meter." Oct. 14.

18,513.—Cock, F. W. C., "Gas-engines." Oct. 15.

18,581.—Terrace, D., "Heating inclined gas-retorts." Oct. 17.

18,605.—Huttenmann, G., and Spieker, G., "Manufacturing blocks or briquettes of fuel from small coal, slack, coal dust, and coke dust." Oct. 18.

18,607.—Creeke, R. W. B., and Balfour, H. R., "Regulating or altering the pressure on the gas in a gasholder." Oct. 18.

18,615.—Fiddes, W., "Charging gas-retorts." Oct. 18.

18,620.—Weyman, J. E., and Ellis, G. W. H., "Supplying and charging the reservoirs of gas-engines." Oct. 18.

18,703.—Allison, H. J., "Gas machine." A communication from F. W. Bardsley. Oct. 19.

18,795.—Clerk, D. and Lanchester, F. W., "Gas and like engines." Oct. 20.

18,852.—Simmons, N., "Detachable joint or socket for pipes and conduits." Oct. 21.

18,855.—Cowan, W., "Automatically varying the load and pressure of gas-governors." Oct. 21.

18,879.—Thorp, T., and Marsh, T. G., "Gas condensers." Oct. 21.

CORRESPONDENCE.

[We are not responsible for opinions expressed by correspondents.]

The "Poser" of Water-Gas Manufacture.

SIR,—We have followed, with the enjoyment that comes only to irresponsible spectators, your occasional exchange of editorial amenities with a Transatlantic contemporary; and it is with genuine reluctance that we abandon, for the moment, the haven—rarely left but regretted—of silence. We feel, however, that we must, with your permission, say a word in answer to your "question of questions for English dabblers in water gas" (*vide* your issue of Oct. 25).

No one of intelligence prefers the claim that water gas can "be made to the same advantage here as in the United States, where the same class of carburetting material can be had for one-third or one-sixth the price." We demur, parenthetically, to your final fraction. One-third is surely all the comparison can bear and preserve the facts; while instances are not few—San Francisco, for example, and the Pacific Slope—where American prices considerably exceed European. But what exponents of the water-gas industry in Europe do claim, as far as the subscribers can speak for them, is that, where gas is required of an illuminating value higher than that yielded by ordinary gas coals, the manufacture of carburetted water gas is a distinct commercial economy, apart from all considerations of the incidental advantages of the system.

For practical support of the above, it is hardly necessary for the "wrestling" Editor of *Progressive Age* to measure (as you invite) his skill against a single cask of Solar Distillate; since the London gas-works are good enough, not only to overthrow, but even to digest and thoroughly assimilate, some one thousand barrels of the fluid daily. Nor is the world's oil trade limited to Solar Distillate.

HUMPHREYS AND GLASGOW.

9, *Victoria Street, S.W., Oct.* 29, 1892.

Regenerative v. Ordinary Settings.

SIR,—In your issue of the 4th inst., Mr. W. J. Latchford, referring to the Presidential Address delivered to the South-West Association, at the Bournemouth meeting, suggests that the cost and the comparatively poor results obtained afford reasons why regenerative furnaces are not generally adopted. Can these reasons be accepted? A good complete regenerative furnace can be erected at a cost not exceeding £5 per mouthpiece, and will carbonize coal with a consumption of from 10 to 15 lbs. of fuel per 100 lbs. of coal carbonized. These results are being obtained in various parts of the country; the amount of coke used being determined by weight. With direct firing, good settings, and very careful management, from 21 to 26 lbs. of coke are consumed per 100 lbs. of coal carbonized, and these results are very exceptional.

For regenerative furnaces, a saving of not less than 10 lbs. of fuel per 100 lbs. of coal carbonized may fairly be claimed; and this saving would in many places pay for the extra cost during the first 200 days' working. With properly constructed regenerators, any desired temperature can be maintained; and the make of gas per mouthpiece will depend in a large measure upon the class of coal used. The advantages of gaseous firing do not depend upon a large make per mouthpiece, so much as on the economy of fuel and labour, the reduced cost of maintenance, and the regularity of working.

The question of gaseous firing should by this time of day be beyond controversy; and yet there are engineers and managers who are decidedly opposed to it, or, at least, they tenaciously cling to direct firing. The amount of prejudice and misapprehension that exists in regard to this matter is simply astounding. Even Mr. Latchford has deluded himself into the belief that his fuel account for last year was 10·26 per cent. (an economy never yet attained by the most perfect regenerator); and another correspondent, "H. L.," hastens to congratulate him, and suggest that he should give information, or write a paper explaining how it was done. Every practical reader knew such results were impossible; but the information in your last issue gives the sequel.

Mr. Latchford assumed a make of 37·8 bushels of coke per ton of coal carbonized. If 32·8 bushels had only been assumed (the amount sold per ton), then there would have been no fuel account at all—a result worth recording. The coal in question will yield over 48 bushels; so that there are some 21,120 bushels of coke to account for, which must of course be added to the fuel account. This will bring it to over 31 per cent. of the coke made—a result not by any means to be ashamed of; being below the average for "ordinary settings."

D. IRVING.

Stapleton Gas-Works, Bristol, Oct. 28, 1892.

P.S.—The figures supplied in your last issue work out 13·3 per cent. of coke used, not 10·26 as stated in Mr. Latchford's first letter.—D. I.

SIR,—I cannot but express my disappointment at the reply that Mr. Latchford has thought fit to give Mr. Irving and others. I am one of those managers who with the aid of hot fuel, a judicious supply of heated secondary air, and a slightly deeper furnace, have for some years past been able to make from 7000 to 8000 cubic feet of gas per mouthpiece per diem, with retorts of similar dimensions to those used at the Broadstairs Gas-Works. But I have never been able to reduce my fuel account to such a low percentage. I am very anxious to do so, if it can be done; and I would feel extremely obliged if Mr. Latchford will inform me through the pages of the JOURNAL what quantity of coke, in bushels, does his furnace consume per 24 hours, and the number of retorts in the setting. This should clear up the matter in a few words.

SAMUEL CARPENTER.

Dorking, Oct. 28, 1892.

The Employment of Chemists in Gas-Works.

SIR,—It is a matter of much surprise that the value of a chemist in the advancement of the gas industry is not more widely recognized than it is, seeing that it is so intimately associated with, and dependent upon, chemical reaction—the rearrangement of the molecules contained in a form of matter, coal. In bringing about this result, there are, of course, a large number of mechanical aids, as with most other chemical industries; nevertheless, though mechanics and physics play an important part, it is essentially a chemical operation. The tone of the letter of your correspondent "Chemicus" (*ante*, p. 514) may—unintentionally, no doubt—convey a false impression of the relation of a chemist to the engineer. He is, or ought to be, a co-worker and helper of the engineer in one particular department. The importance of a skilled man to supervise each department, and having a thorough knowledge of its special requirements and its bearing upon the efficiency of the whole of the working, is generally admitted. That the engineer is so conservative or short-sighted as to ignore the bearing of chemistry upon his work, or to hamper the chemist in his investigations, I can hardly believe. A careful perusal of the JOURNAL will scarcely support, even if it does not entirely contradict, such an idea. Certainly some of the best contributions to our knowledge of gas manufacture have been made by those engineers who, it is evident, see its important bearing upon its successful working and advancement—men of liberal mind and broad views as to the relation of the different branches of the work to each other.

There is another reason why a man who has had a special chemical education should be included in the staff of a gas-works. There are many questions awaiting solution that require a great deal of research and patient application, together with the investigation of different methods, in putting the same question as to the efficient working of a process—viz., as to which method gives the most reliable and correct results. Those who have devoted themselves to some of these questions know that the study of them takes up a great deal of time. Can it, then, be expected that the engineer or the manager will be able, with the multiplicity of his duties, and the general supervision of the whole works devolving upon him, in addition to devote himself to these special researches? No doubt he is the man who will be in a position to collate all the information and experience available from every source, both from the laboratory and the works, and be able to solve many doubts upon, or improve his methods of working; and in this respect, among others, the chemist would be of great value to him. If the obstruction to such a *desideratum* lies in the attitude of boards of directors and gas committees, the sooner they have broader and more correct views, the better it will be for the industry at large. But, in order to effect this, there must be a just recompense for the chemist's services, and not the meagre "retort-house ganger's pay." It might well make a young chemist stop and think whether he shall devote himself to the advancement of the gas industry, or to some other where his worth would be more recognized and rewarded. Apart from the special training and probable bent of mind in the direction of chemical studies, there is the necessity of being acquainted with the particular kind of duty that will devolve upon him in a gas-works; and when the expense of such training, the study, and the hard work necessary are taken into account, it is only just that a chemist should have remuneration commensurate with the importance of his services. In fact, this must be the case, if young men are to be attracted to its pursuit.

B. W. FLUKE.

Trowbridge, Oct. 24, 1892.

Tar Pavement.

SIR,—I have had many inquiries for a "wrinkle" about tar pavement, to most of whom I have replied; but I think, for the benefit of your readers, I cannot do better than describe shortly my method of making and laying the pavement—trusting that someone may be able to grasp and apply the "wrinkle," if one there be!

Having selected the best material to be had in the district—road metal refuse, granite chips, or gravel (this latter I have not used, but do not see why it should not do), proceed to sift out the dust or sand, if any. This can be used to dust the top of the finished pavement, giving it a light colour, and assisting it to harden. The chips are much easier mixed when free from dust, and less tar is required. Use the tar from the tar-well (not prepared or distilled in any way), the same as you would use cement in making concrete—only enough to coat the material thoroughly. Then, when sufficient has been mixed to finish the path or floor, allow it to remain in a heap for at least a week before laying down. This permits all the surplus tar to drain out, and the mixture becomes tougher every day. This can be tested by pressing the heap with the foot; and practice will teach when it is ready to lay down. This must depend on the weight of the roller used; for if kept too long, it will become too tough to secure a smooth surface. At the same time, the longer it is kept, the better the path will be, provided it can be rolled or rammed. Use water on the roller or rammer, to work up the face and prevent it lifting; and so soon as the rolling is finished, dust the surface and turn on the traffic if a foot-path. If a floor, it had better rest for a week; and if the floor of a coal-shed, the first coals can be deposited lightly till the floor is out of danger.

When a foundation is required, use road metal of 2-inch size. Mix same as chips, and lay from 4 to 6 inches deep, according to the strength of the floor required. This size need not be kept any time, but laid as mixed (the tar will drain into the ground); and it may be well rolled in a day or two.

The size of chips I use is from ¼ to ¾ inch; and, if mixed as above, no temperature a foot-path is liable to be subjected to, will alter the surface in any way, not even if laid in a retort-house. I had a trial patch laid 9 feet from the furnace door two years ago; and it has not altered in any way.

I shall be pleased to give any further details through the JOURNAL. But I think if any one follows the above instructions, he cannot fail to secure a good tar pavement or floor; and I shall be pleased to hear if anyone profits by the above "wrinkles."

THOS. D. HALL.

Montrose, Oct. 28, 1892.

Anthracene.

SIR,—In all the letters written to you about anthracene, I do not find any practical idea as to how to get over the fact that The Gaslight and Coke Company cannot speculate in anthracene dealings, and so run up the price of this article, as was done by ordinary traders some years

since. It is all nonsense to think the tar distillers' interests are the same as those of the gas company. The latter want to see the old insane competition for tar that was the order of the day a few years since, and is even now among a few men who, I should think, never work out results. I hope a sounder system is in operation, for tar distillers have nothing but curses for the name of anthracene; it has always been a delusion and a loss. Profits of one year have been swept away by competitions for tar next year.

I do think, however, firmer markets could be had for all tar products, if The Gaslight and Coke Company and other great makers were to finish the work, instead of selling benzol, anthracene, &c., to the Germans to manufacture into colours. I am informed that certain German factories in this line pay from 25 to 40 per cent. But say it was only 15 per cent., it would surely pay better to fight the Germans on colour than on the half-finished article. They would have to pay higher prices for anthracene to keep their works going rather than close them. This would run up colour; and the wretched English manufacturer would probably benefit. In these days we are at the mercy of Germany and the Germans, whose energy and skill have run us out of the markets; miserable profits being the cause. Manufacturers having no margin to work on, and crushed with taxation and vexatious restrictions, what else could be expected? Let the Beckton people show the way; for, with all their faults, they are straightforward dealing and reliable. Mr. Livesey must not forget that his Company are quite as much tar distillers as The Gaslight and Coke Company; for they sell on a sliding scale, thus taking their share of profits or loss. I expect the cry made over this wretched stuff is to start us fools of tar distillers to our usual suicidal trading; Beckton and the South Metropolitan Company standing outside—one openly, and the other under the rose.

Oct. 26, 1892. A Silly Tar Distiller.

The Estimation of Carbonic Acid and Sulphuretted Hydrogen in Gas.

Sir,—In the article on "Coal Gas: Its Manufacture, Distribution, and Consumption," in the Journal for Sept. 27 (p. 548), reference is made to the gravimetric estimation of carbonic acid by precipitation with excess of barium hydrate. Permit me to supplement what is there given by pointing out the advantage of using a Bunsen filter-pump and platinum cone. The method of employing a ribbed funnel, and covering it with a glass plate, I have found to be very long and tedious; and it is likely to give too high a result from absorption of carbonic acid from the atmosphere, especially in the vicinity of a burner or a gas-light. With a Bunsen's pump, or a pump tube, the filtering is very rapid and accurate; and it only needs a high-pressure water supply to work it effectually.

There seems to be some confusion with reference to the volumetric process for estimating sulphuretted hydrogen. The writer of the article directs us to use 20 grains of lead acetate to a pint of distilled water; whereas Wanklyn says 32 grains per pint. The reaction is—

$$Pb(C_2H_3O_2)\,2 + 3H_2O + H_2S = PbS + 2\,HC_2H_3O_2 + 3H_2O.$$

Taking the atomic weights in round figures, we have 379 as the molecular weight of lead acetate; that of sulphuretted hydrogen, 34.

Then— $\frac{34}{379 \times \cdot 01} = 0{\cdot}11147 =$ the amount of lead acetate required to combine with 100th of a grain of sulphuretted hydrogen (the amount in 1-16th of an ounce), which multiplied by 16 gives the amount for 1 oz.; and this multiplied by 20 equals that required for a pint (20 ozs.), which is 35·67 grains. Roscoe and Schlormmer's "Treatise," Bloxam, and several others, assign the above formula to lead acetate.

Oct. 24, 1892. Zeno.

Chandler's Washer.—Writing on the subject of this appliance, which was described and illustrated in the Journal last week, Mr. W. Froggatt, Assoc.M.Inst.C.E., of the Thorncliffe Iron-Works, near Sheffield, says it is an old acquaintance of his own. In substantiation of this statement, he sends a tracing of a washer designed by him, and made and erected by Messrs. Newton, Chambers, and Co., Limited, for the Bakewell Gas Company in the year 1881, from which date to the present time it has, he says, been in use there.

The Gas Agitation in the Salford Out-Districts.—Last Wednesday, a deputation from the Swinton and Pendlebury Local Board waited upon the Barton Rural Sanitary Authority to ascertain whether the members were favourably disposed (subject to terms to be agreed upon) to Swinton proceeding in the next session of Parliament with a Bill for the manufacture and supply of gas to Swinton, Pendlebury, Clifton, Walkden, and the district of the Little Hulton Local Board. Several proposals were laid before the Authority, one of which, it is understood, was accepted. It seems to be thought that, if the consent of the Rural Sanitary Authority and of the Little Hulton Local Board is obtained, a Bill may be carried through Parliament by Swinton.

Awards at the Gas Exhibition at Gouda (Holland).—The Mayor of Gouda lately opened a gas exhibition in that town, which was organized and arranged by Mr. J. J. Prins, Manager of the gas-works, to supplement his efforts to introduce various gas appliances to the notice of the inhabitants. Mr. Salomons, from the Amsterdam station of the Imperial Continental Gas Association, was present at the opening ceremony. A jury (composed of Mr. J. A. François, the Chairman of the Dutch Association of Gas Managers; Mr. Salomons, of Rotterdam, Secretary of the Association, and Editor of *Het Gas;* and Mr. Prins) was selected to examine the exhibits; and among the awards made by them were the following: Messrs. J. Wright and Co., Limited, two gold medals and a silver medal; the Lamp Manufacturing Company, Limited, a gold medal, for the "Fullford" lamp; Messrs. W. Sugg and Co., Limited, three gold medals; Messrs. H. E. Yates and Co., of Birmingham, a silver medal; Messrs. Wells Bros., of Sandiacre, Nottingham, a silver medal; Messrs. Körting Bros., of Hanover, a gold medal.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Tuesday, Oct. 25.

(*Before Justices* Mathew *and* Bruce.)

In the Matter of an Arbitration between the Richmond Gas Company and the Mayor, Aldermen, and Burgesses of the Borough of Richmond.
Defective Public Lighting in Frosty Weather.

This was a special case, stated by Mr. Shiress Will, Q.C., the Umpire in an arbitration in progress between the Richmond (Surrey) Gas Company and the Corporation of that Borough; two Arbitrators (Mr. G. Livesey and Mr. C. Burt) having differed upon a point of law which had arisen during the proceedings. It set forth that the Company were incorporated under the Richmond Gas Act, 1867, and the Richmond Gas Act, 1881—the latter Act incorporating the Gas-Works Clauses Acts of 1847 and 1871. By section 48 of the Act of 1867, it was provided that the Company should, at such times as they might be called upon to do so by the Vestry of Richmond, or such other persons as might be charged with the lighting of any street or place within the parish, supply gas to all the public lamps or burners, situated within 70 yards of their mains, which might be provided for lighting such street or place, and during such hours as should be settled by agreement between the Company and the Vestry. By section 24 of the Gas-Works Clauses Act, 1871, it was provided that the undertakers should supply gas to any public lamps within a distance of 50 yards from any of their mains, in such quantities as the local authorities within the limits of the Special Act might require; and the price to be charged was to be settled by agreement between the parties. By section 36 of the same Act, it was provided that, whenever the undertakers neglected or refused to supply gas, to all or any of the public lamps, in accordance with the provisions of the Act, they should be liable to a penalty not exceeding 40s. for each default. By section 25 of the Company's Act of 1881, it was provided that the charge for supplying gas to the public lamps in Richmond, including the provision and use of the lamps, posts, &c., the renewal and maintaining thereof, and the lighting, cleaning, and extinguishing of the lamps, should, on and from the 30th of June, 1881, be £4 5s. per lamp per annum, subject to an increase or reduction of 5s. per lamp per annum for every rise or fall of 3d. per 1000 cubic feet in the price charged to the ordinary consumers of gas within the parish. The lamps were to be lighted from sunset to sunrise; and the burners used therein were to consume not less than 5 cubic feet of gas per hour. During the period between Oct. 1, 1890, and March 31, 1891, the Company supplied gas to the parish. The duty of providing for the public lighting was, for the earlier portion of the above-named period, vested in the Vestry of Richmond, as the Urban Sanitary Authority; afterwards, in consequence of the incorporation of the town, it passed into the hands of the Corporation, who, under the terms of the Royal Charter, assumed all the duties and liabilities of the Vestry. Having thus indicated the position of the parties, the special case went on to state that, during the months of December, 1890, and January, 1891, it frequently happened that many of the public lamps were not kept lighted by the Company "from sunset to sunrise," and that many others consumed less than the stipulated "5 cubic feet of gas per hour." It was admitted, for the purpose of the case, that this was due to the frosts which occurred in those months, the consequence of which was that "the aqueous vapour unavoidably present in the gas was frozen in the pipes, and naphthalene crystals were deposited therein; and that by the ice and crystals so formed, the pipes were on several occasions stopped up, and the passage of the gas to the burners prevented." It was also admitted that some of the frosts were of exceptional duration and severity; and that the Company made special efforts to overcome the obstructions referred to—employing extra labour, and spending large sums of money thereon. It was agreed between the parties that all questions as to the extent to which the matters above mentioned were due to frosts of exceptional duration and severity, and also all questions of amount, should be hereafter, if necessary, settled by the Umpire. The Company contended that they were entitled, for the period named, to be paid the full price provided for in the 25th section of their Act of 1881, without any deduction in respect of the deficiency of supply or consumption of gas, and without having to make or allow any payment to the Corporation, whether by way of damages or otherwise; further, that the only remedy, if any, the Corporation had was to proceed for penalties under section 36 of the Gas-Works Clauses Act, 1871. The Corporation, on the other hand, maintained that, in cases in which there was deficiency of supply or consumption, whether due to the causes stated or otherwise, the Company were not entitled to recover the full statutory charge, but only such sum as might be fair, having regard to the quantity of gas actually provided. The question for the Court to decide was which of these contentions was well founded in law.

Mr. Ram appeared for the Company, and argued that the proper supply of gas was prevented by circumstances beyond human control—in fact, by an *actus Dei*. In the case of a common law liability, such an act was considered to be sufficient excuse for not discharging it; and the same principle applied in the case of a statutory liability. [Counsel cited cases in support of his contention.] But if the Company had been guilty of neglect, the right course was for the parties aggrieved to proceed for penalties under the Acts.

Mr. C. A. Russell, on behalf of the Corporation, said the real point was this: Should they be made to pay for gas which had never been supplied? Before the Company could recover the sum named in the statute, they must show they had fulfilled the duties imposed by it. This they could not do.

Justice Mathew said that he was of opinion that judgment must be entered for the Company. The question was whether or not they must submit to a reduction in the lump sum provided by statute for each gas-lamp, in consequence of occurrences which were unavoidable, and over which they had no control. Very little aid could be derived from looking at the law relating to contracts. The Act of Parliament under which the Company was established authorized

them to invest money in providing the necessary plant for the supply of gas for public lighting; and the Corporation were to pay £4 5s. per lamp per annum for the gas so supplied within the parish of Richmond. The statute contained a very important clause, specifying the events in which the Company might be regarded as not having complied with the terms of the Act; and it imposed a penalty not exceeding 40s. for every default. Now, it was admitted that it was impossible to convey the gas to the lamps by the ordinary method owing to the period of the frost; and that the Company made special efforts to overcome the difficulty by employing extra labour, and by spending a large amount of money in so doing. The Company, in fact, did everything they could to supply gas to the lamps; it being admitted that on their part there was no neglect which could justify the Magistrates in imposing a penalty. The Company supplied the gas; but it could not reach the lamps from causes over which no human being had any control. They were therefore entitled to be paid a lump sum in consideration of the expenditure to which they were put. Mr. Russell had argued that the Act of Parliament was a contract by which the Company had bound themselves to supply light within the lamps, so that, if the light were turned out, or extinguished by a storm, the Corporation would be entitled to take note of it, and deduct something from the lump sum provided by the Act—in other words, that the statute was to be construed as a positive obligation imposed by the Legislature upon the Company, to ensure that, under all circumstances, all the lamps should be lighted every night, and that the quantity of gas consumed in each should be that which was prescribed. Such a construction would, to his mind, be most unreasonable. Full effect could only be given to the Act of Parliament by saying that the Company were entitled to the full lump sum; and, it being admitted that they could not secure the lighting of the lamps by any reasonable method, it was no answer to their claim under the Act of Parliament to say that the lamps were not lighted during the whole time contemplated.

Justice BRUCE said he was of the same opinion, though at first he thought the contention somewhat unreasonable, that the Corporation should pay the entire amount of £4 5s. for every lamp, when they had not received the full benefit stipulated for during a certain portion of the year. But when one came to consider the whole case, it was clear that the statute imposed upon the Company certain obligations; and they were liable to penalties if they did not comply with them. The statute also imposed upon the Corporation payment of a lump sum of £4 5s. per lamp; and this obligation they too must discharge. It was suggested by Mr. Russell that, if the Company did not furnish the full quantity of gas they were bound to supply, the lump sum might be apportioned. He (Justice Bruce) thought this could not be done in any way. It would be most unreasonable to say that nothing should be paid to the Company merely because, on one night in the year, all the lamps had not been lighted.

Mr. RUSSELL asked, for the sake of saving further expense, whether their Lordships' judgment in any way depended upon the fact that it was the act of God which prevented the Company from supplying gas.

Justice MATHEW said that had nothing to do with his judgment.

The case will now be remitted to the Arbitrators, with an indication of the opinion of the Court on the point raised.

Thursday, Oct. 27.

(*Before Justices* MATHEW *and* BRUCE.)

Sidgwick (Appellant) v. Sunderland Gas Company (Respondents).
The Liability of Sulphate of Ammonia Stills for Excise Duty.

This was a case stated by the Justices of Sunderland. It arose out of an action brought by the Inland Revenue authorities against the Sunderland Gas Company, to test the question of their liability for the payment of Excise duty on their stills for the manufacture of sulphate of ammonia. The proceedings in the Lower Court, where the case was dismissed, were reported in the JOURNAL for May 10 last (p. 855).

Mr. DANCKWERTS appeared for the appellant; Mr. MOULTON, Q.C., and Dr. BLAKE ODGERS represented the respondents.

Mr. DANCKWERTS said the appellant was an officer of the Inland Revenue; and the case, as stated, omitted two material facts which, he thought, would greatly assist their Lordships in deciding the matter submitted to them. This he would be able to make clear when he had read the case; and then, if their Lordships thought fit, he should ask them to send it back to the Magistrates to state those facts. The short question was whether the instrument described in the case was a still or retort requiring a license within the meaning of the Act of Parliament. The respondents were summoned by the officer of Inland Revenue because they, not being a Company carrying on business as distillers or rectifiers, compounders of spirits, or vinegar makers, kept and used a certain still without having taken out such a license as was required by the statute. The Act enabled the Commissioners of Inland Revenue to permit the keeping or using of any still or stills for experiments in chemistry, under such regulations as they thought fit; and also to allow persons carrying on trade or otherwise for the manufacture of any article other than spirits or spirit mixtures, to use a still, on giving notice to the nearest officer, and conforming to such regulations as the Commissioners might think fit to direct. The respondents were authorized to deal with their residual products. The sixth paragraph of the case stated that the apparatus referred to in the information was for the manufacture of sulphate of ammonia, and was described in the plan annexed thereto, which was to be considered part of the case. It would be seen by the plan that there were two appliances described—one coloured blue, and the other red; and it was the red one which was in question. The plan accompanying the case was made from the point of view of a person looking on to the apparatus from above. But there was placed before the Magistrates another plan, which showed it in vertical section; and the specification accompanying it contained a full description of the apparatus the subject of the patent. This was proved to be accurate; and, in his view, it was extremely material that their Lordships should have this before them. It was Davis's patent for the construction of ammonia stills.

Mr. MOULTON remarked that this had nothing to do with his clients.

Justice MATHEW: Except the use of the word "still?"

Mr. MOULTON said he supposed that, because the patentee used the word "still," his friend thought he could succeed in a criminal prosecution against somebody else.

Justice MATHEW replied that this would not be evidence.

Mr. DANCKWERTS said his learned friend had attempted to get rid of what he was about to say. That was not the sole reason why he wished to put in the plan. It was because it described the process that was carried out by the apparatus.

Justice MATHEW observed that they were dealing with a question of law, and questions of fact ought not to be brought before them. No doubt the Magistrates had found that the apparatus in question was not a still.

Mr. DANCKWERTS said he did not agree with that.

Justice MATHEW: Then I think they should try and find out.

Mr. MOULTON said they had.

Justice MATHEW said they would probably have to do so if they had not. It appeared from the case that the Magistrates held that it was not practically or commercially a still.

Mr. DANCKWERTS submitted that this was not the question. What they said was that it might be possible to effect a distillation with the apparatus in question by way of an experiment, but that the quality of the spirit to be obtained would be so low, and the cost so great, as to render it practically and commercially useless for the purpose; and therefore they held it was not a still within the meaning of the Act.

Justice MATHEW asked if it was argued on the part of the Excise authorities, that this apparatus, which appeared to be used in the production of an exceedingly disagreeable substance, might possibly be used for distilling whisky, or some other beverage of that sort, and that therefore it was a still.

Mr. DANCKWERTS said it was not; the contention of the Inland Revenue authorities was that it was immaterial whether it could or could not be commercially used for that purpose. It was sufficient if it was a chemical still.

Justice MATHEW inquired if this point was taken before the Magistrates.

Mr. DANCKWERTS replied that it was.

Justice MATHEW said the finding was hardly consistent with that suggestion.

Mr. DANCKWERTS said the argument for the appellants was stated very shortly in the ninth paragraph. In his view, it was essential that the Court should have before it a more accurate—in fact, a vertical—section of the apparatus in question. The one he held in his hand was put in and marked by the Justices' Clerk as an exhibit.

Justice MATHEW said it would be dangerous to use it, if it was not referred to in the case.

Mr. DANCKWERTS said that was why he asked for the case to be sent back, so that the Magistrates should state whether or not the description in the patent was an accurate one of the apparatus in question.

Mr. MOULTON said he should make no objection to their Lordships having a vertical section of the actual appliance in use; but, of course, he should object to any patent being put in.

Mr. DANCKWERTS then proceeded with the reading of the case. It stated that the respondents had two sets of sulphate of ammonia plant; and it then went on to describe the one coloured red, which was the one complained of. The ammoniacal liquor was pumped into a wrought-iron tank in the roof of the building, whence it flowed into an economizer (a cast-iron vessel sunk in the floor) containing a coil, through which the hot waste liquor ran on its way to the drain. He thought this meant that, for the sake of saving heat, the waste liquor, which was warm, was used to heat the ammoniacal liquor coming from the tank in the roof. The fresh liquor circulated round the coils, and was warmed; then, rising from the economizer, it was passed up through long chambers to column A, called the "heater." The waste gas was introduced into the heater shown on the plan; and, by reason of its being so heated, the liquor rose until it passed up a pipe into the second column B, made of cast-iron, divided horizontally into fourteen shallow chambers. This was the important appliance made under the patent. In these chambers, provision was made for the passage of some of the gaseous products through the centre of the column, and for the flow of the liquid downward by the sides. The liquid entering the column B fell from chamber to chamber. Steam was introduced into the bottom of the cylinder by means of a pipe, and rose through the orifices in the plates. This volatilized the ammonia contained in the liquor; and, thus vaporized, it passed away in the steam into a pipe fixed in the top of the cylinder as far as the baffle-box, which was marked on the plan. It then proceeded some 40 feet in a horizontal direction, but with the inclination of the pipe towards the baffle-box; and it then fell vertically, until the open end was submerged in the saturator—a lead-lined vessel charged with sulphuric acid. Half way down the column B, the liquor was treated with milk of lime. This part of the process was not described; and, although he might be able to explain it himself, he thought the case should state it for their Lordships' information. After passing through the lower series of chambers, the liquor went in a boiling condition through the economizer, and the waste ran away to the drains. When the volatilized ammonia and steam passed into the sulphuric acid in the saturator, a chemical combination took place, by which the ammonia was formed into sulphate, while the steam passed away through the waste-pipe, and was again utilized in the heater. The sulphate of ammonia fell on to the floor of the saturator, and was then fished out, and dried upon a draining-table. It was the concluding part of the paragraph in which, he submitted, there was a defective statement; and what he desired to have supplied was this: When the volatile ammonia, with the steam, reached the dilute sulphuric acid in the saturator, the process which first took place was the condensation of the volatile ammonia, or vapour of ammonia, into ammonia liquor, and then this combined with the sulphur in the sulphuric acid and formed sulphate of ammonia in a suspended condition. But it was only after a considerable period that the crystals were formed, and deposited at the bottom of the saturator. The point was that the condensation of the ammonia vapour took place before the combination with one of the ingredients of the sulphuric acid.

Mr. MOULTON said, as he understood, the appellant never attempted to prove such a thing before the Magistrates; and, to the best of his belief, it was not true. At any rate, not a word of evidence of this kind was put forward.

Mr. DANCKWERTS said his friend Mr. Alpe, who conducted the case before the Magistrates, informed him that it was.

A further discussion ensued as to whether or not any evidence on this point had been given; and ultimately it was agreed that the case should be sent back, in order that the Magistrates might state it more fully, and, if necessary, take further evidence as to the nature of the process conducted. The costs were reserved.

Guildhall, Tuesday, Oct. 25.

(*Before Mr. Justice* LAWRANCE *and a Special Jury.*)

Evans v. Smith—A Purchase of Shares Annulled on the Ground of Misrepresentation.

This was an action brought by Mr. David Evans, of Wood Street, to annul a purchase of 90 shares in the Amsterdam Hill Water Company from Mr. George Frederick Smith, on the ground that he was induced to buy the shares by misrepresentation on the part of the defendant, and the concealment of certain material facts. The defendant denied misrepresentation, and pleaded that the facts alleged to have been concealed did not really exist.

Sir E. CLARKE, Q.C., and Mr. W. WILLS appeared for the plaintiff; Mr. F. A. BOSANQUET, Q.C., and Mr. J. RAYMOND represented the defendant.

Sir E. CLARKE, in opening the case, said the plaintiff was senior partner in the firm of Messrs. David Evans and Co., carrying on business as warehousemen, in Wood Street, Cheapside; and the action was brought against the defendant for misrepresentation with regard to certain shares, whereby the plaintiff was induced to purchase 90 shares in the Amsterdam Hill Water Company, at a price of £3000—being £23 5s. per £20 share. The Company was founded in 1851 to supply Amsterdam with water; and up to the year 1885, it gradually increased its success—in that year paying a dividend of 15 per cent. The Municipality of Amsterdam, however, thought the concession too favourable to the Company, and too much against the inhabitants; and therefore they revoked it. After some negotiation, the Company accepted another concession; but from that time the dividends gradually diminished until, in the year 1880, they came down to 5 per cent. Prior to 1885, the plaintiff was indirectly connected with the Company—being the holder of shares as the Executor under his father's will; but in that year the shares were sold. In August, 1890, plaintiff and defendant met as Directors of the Antwerp Water Company; and, after the meeting, the defendant urged the plaintiff to purchase shares in the Amsterdam Hill Water Company—stating that the £20 shares could be obtained for £23 5s., and at that price would produce 4 per cent. interest. After certain negotiations, the plaintiff purchased 90 shares; but had he then known that the undertaking was not in so prosperous a condition as he was led to suppose, and that the shares in question belonged to the defendant, he would not have bought them. The real facts of the case showed that, at the date of purchase, the Company had only paid 3 per cent. dividend; and in order to do so, the Directors had to take £3000 from the reserve fund. Therefore, at that time, the shares were not worth anything like the price given for them. Consequently, when the jury found that the shares were sold by their owner at an enhanced value, on the representation that they were not his shares, but were obtained from other persons, the learned Counsel contended that the plaintiff was entitled to the relief he asked.

Evidence having been given in support of the plaintiff's case,

Mr. BOSANQUET submitted that his friend had failed to show that the defendant had said anything he knew to be wrong; therefore, there was no case to go to the jury.

Sir E. CLARKE maintained that the issue raised was one which ought to go to the jury.

His LORDSHIP considered that, in face of certain passages in the correspondence, it would be better to hear the defendant's case.

Mr. BOSANQUET thereupon submitted that there had been no concealment of any material facts, but that what was, or ought to have been, common knowledge was not disclosed. Under the circumstances, he contended that the action failed, and should be dismissed.

Mr. *G. F. Smith* was then called, and stated that he was Chairman of what was called the Commissaries in London of the Amsterdam Hill Water Company. In 1886 he purchased 100 £20 shares, and 105 £10 shares in the Company from the plaintiff for £5718 15s.; and on that occasion the plaintiff said that, if the shares went down, he would take some back, or would buy anything likely to return 4 per cent. interest. In consequence of this, on Aug. 14, 1890, he communicated with the plaintiff; and the result of that was the sale of the shares in dispute—plaintiff even asking for more shares at the price, if they were to be obtained. To make up the 90 shares he sold to the plaintiff, he had to get 50, on some of which he paid a premium.

In cross-examination, witness said the shares he bought were purchased at par, though he wrote to the plaintiff that he could procure them, if he wanted them, at £23 5s. per £20 share. He considered this was a perfectly honest transaction, especially when it was remembered that he had bought shares in the Company from the plaintiff at £37 15s. per £20 share, and still held some of them. In the year 1890 he did not decrease his holding in the Company, and was compelled to keep 25 shares to qualify him as Chairman of the Commissaries. Prior to 1885 he was connected with the Company; and since that time he had been Chairman of the Commissaries.

Wednesday, Oct. 26.

On the resumption of the proceedings this morning,

Defendant was further cross-examined by Sir E. CLARKE. He stated that the proceedings at the meetings at Amsterdam of the Directors of the Company there were translated from the Dutch into English, and circulated among the English shareholders; and therefore the plaintiff did not require to be informed as to their future policy.

Mr. *C. Barclay*, Secretary to the Commissaries, said he kept the accounts of the Company in England. In 1890 the amount for interest and amortization upon the works then in progress was charged to capital and not to revenue; but after that it was charged to revenue at the instance of the Amsterdam Corporation or community, who had controlling power over the Company. The dividend declared on the 1891 account was 3 per cent. without drawing upon the reserve or contingency fund. This was £3000 better than in the previous year.

Mr. BOSANQUET, in summing up the case on behalf of the defendant, pointed out that there was no guarantee whatever that the investment would return 4 per cent. in any particular year, but was represented as a likely investment to produce this amount at no distant period. It was alleged that the fact that the amount paid for interest and amortization of the loans was charged on revenue instead of to capital was concealed from the plaintiff; but it was not until February, 1891, that the Commissaries were made acquainted with the alteration. Under all the circumstances, it was clear the transaction was a *bonâ fide* one; that there was no fraudulent misrepresentation or concealment; and that therefore the defendant was entitled to a verdict.

Sir E. CLARKE, in reply, urged that the case had been materially strengthened by the fact that Mr. Smith was acquainted with the condition of the Company through having attended a meeting on May 30, 1890, when a report of the true state of its affairs was presented. This proved that he knew he was misrepresenting the facts, and, further, he concealed the fact that the shares he proposed to sell were his own. If Mr. Smith had said they were his own shares, Mr. Evans would have taken more precautions than he did. But the case turned out to be even worse than this, because, at the time the defendant was offering the shares as a friend, he was contemplating the making of a profit out of the transaction. Both in law and in justice, Mr. Evans was, the learned Counsel contended, entitled to call upon Mr. Smith to pay him damages for the misrepresentations to which he had been subjected, and by which he had lost money; and he could not imagine, after the investigation that had taken place, that the jury would say the transaction on the part of the defendant was a fair and honest one, and that the plaintiff must keep shares put upon him at an exorbitant price by misrepresentation.

His LORDSHIP having summed up,

The jury retired to consider their verdict. After an absence of an hour and a quarter, they returned, and gave a verdict for the plaintiff; assessing the damages at £162 10s.

His LORDSHIP gave judgment accordingly, with costs; the money to be paid into Court within 14 days.

A Stoppage in the Gas and Water Supply of Selby.—During the disastrous floods which recently occurred in Yorkshire, the gas and water works at Selby were surrounded by water to a considerable depth. All efforts to keep the fires alight were of no avail; and the town was thus for a time deprived of a supply of both gas and water. The streets presented a most desolate appearance, as, while they were in darkness, oil-lamps were used in the various business establishments and at the railway station.

Electric Lighting for Bolton.—After lengthened inquiry, the Bolton Corporation have definitely decided to put down an installation for supplying electricity to business firms requiring it and to the public offices; and it is suggested that it should also be employed as the motive power for the tram-cars. It is likely that the system adopted will be the high-tension continuous current; and the works will be capable of supplying 4000 16-candle lights. The central station will probably be constructed on land contiguous to the gas-works.

German v. English Tubes and Fittings.—The British Consul at Stockholm states that, for tubes, fittings, and hardware generally, British makers a few years ago had a good market in Sweden; but lately the Germans have been steadily out-competing them. That their goods are inferior to the British, is indisputable. But they are cheaper; and this appears to rule the market. It is to be feared that, unless English manufacturers can see their way to furnishing a cheaper class of goods, they will have little chance of maintaining their Swedish trade connection in manufactured iron.

Explosion of Gas at Everton.—Last Friday week an explosion of gas occurred in a house occupied by a Mr. Sinclair, at Everton (near Liverpool). It appears that Mr. Sinclair and his wife were retiring to bed; and, on entering their bedroom, they found it full of gas. The woman, who was carrying a lighted candle, went up to the gas-bracket to ascertain where the gas was escaping. A loud explosion immediately followed; and she and her husband were enveloped in flames. Attracted by the noise, a police officer was quickly on the scene; and the injured couple were taken to the Stanley Hospital, where Mr. Sinclair was found to have received severe burns on the head and face, while Mrs. Sinclair was seriously burnt all over the body.

The Committal of Defaulting Gas Consumers.—An unusual, if not altogether unique, application was made to Mr. Baron Pollock and Mr. Justice Hawkins in a Queen's Bench Divisional Court last Wednesday. It was for a rule *nisi* calling upon the Magistrate of the Lambeth Police Court to show cause why a writ of prohibition should not issue, restraining him from proceeding under a committal order made by him on the 13th ult., under the following circumstances: A certain gas consumer failed to pay his bill, and was in due course sued for it in the Police Court. The debt having been proved, the defendant did not discharge it; and the result was the making of the order. In the Superior Court, it was contended that this action on the part of the Magistrate was *ultra vires*. He had no power to commit except on proof being given that the delinquent possessed means; and no evidence of this, said the learned Counsel (Mr. Williams) who made the application, was before him. The defendant was a clerk with a salary of £160 per annum; but he had overdrawn it to such an extent that he was only receiving half this amount, out of which he was compelled to pay £6 per month to clear off his debts. He had also to contribute to the support of his children; he being a married man living apart from his wife, who had considerable separate estate. Baron Pollock remarked that, if the facts as stated were correct, the case was a remarkable one; and he would therefore grant a rule.

MISCELLANEOUS NEWS.

CEARA GAS COMPANY, LIMITED.

The Annual General Meeting of this Company was held last Friday, at the London Offices, 9, Queen Street Place, E.C.—Mr. HORATIO BROTHERS in the chair.

The SECRETARY (Mr. T. Guyatt) having read the notice convening the meeting, the Directors' report and the accounts for the year ended June 30 last were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said that the latter, though in some respects not so satisfactory as those for the year 1891, were on the whole favourable. The receipts for gas showed an advance of about £182. The increase, however, was wholly from the public lighting; there having been a decrease of nearly £170 in the amount derived from private consumption. The residual products exhibited an increase of £125; and the profit on fittings about £235. The quantity of coal carbonized had been 97 tons more; but the cost had only advanced by the sum of £24—the price per ton being 2s. 8d. less than in 1891. The make of gas per ton of coal had been slightly lower; and the leakage had increased from 6 per cent. to about 7¾ per cent. The cost of manufacture—comprising the three items of manufacture, repairs, &c., and maintenance—was higher by £277. The other items on the debtor side of the revenue account, he said, called for little remark, except the one of exchange, which had gone up from £1364 in 1891 to £2354 in 1892; but the Directors hoped that, as the rate of exchange had since risen, and was still rising, the accounts for the current year would show a decline in this formidable and uncontrollable item. The profit for the past year was £3311, or about £761 less than in the previous year; but, as the loss on exchange last year was something like £1000 more than in 1891, the result of the year's working could not be considered other than satisfactory. In the remarks he had the pleasure of addressing to the shareholders last year, he adverted to the fact that the whole of the capital had been expended on the works and plant, and that the working capital consisted of the reserve fund only. Since that period £3271 had been spent on works and plant; leaving, even with the reserve fund, practically no working capital at all, which had been, and was now, a source of loss and of great inconvenience in the management of the Company's affairs. Thus, with a capital all told of £40,000, the sum of £43,000 was invested permanently in works and plant. Under these circumstances, it must, he said, be apparent to the shareholders that the concern could not be carried on without further capital. He also referred at the last meeting to a proposal of the Directors to issue debentures to the extent of £5000; but as a financial crisis supervened in Brazil, they deferred taking further steps in the matter until the time was more favourable, which they now believed had arrived. To show the solidity and vitality of the Company as an investment, he gave a few facts, as follows: During the ten years from 1882 to 1892, the revenue increased from £10,407 to £16,727; the prices of gas in the meantime having been reduced. The revenue from the sale of gas from the year 1874 to 1892 had nearly doubled; and the profit earned had increased in a greater ratio than the receipts. The profit in 1882, with a loss on exchange of £248, was £2138; whereas in 1892, with a loss on exchange of £2354, it was £3311. By eliminating the loss on exchange in both years, they obtained the true result of the comparative working in the two periods. Thus it would appear that in 1882, with a revenue of £10,407, the profit they had derived (exclusive of exchange) was £2386; and in 1892, with a revenue of £16,727, it was under similar conditions £5665, or an increase of 137 per cent., whereas the receipts from gas supplied had only increased 60 per cent., which clearly indicated that the Directors and officers had not been unmindful of the confidence reposed in them. During the eighteen years from 1874 to 1892, there had been an expenditure on capital account of £18,506; and in that period £5758 had been written off—leaving only a net expenditure in eighteen years of £12,747 to meet an increase in the make of gas of double the amount produced in the first-named year. In view of the required increase in the capital for additional works and plant and for working capital, the Directors proposed to raise the share capital from £40,000 to £60,000. Of the £20,000, they intended to issue £10,000 at an early date *pro ratâ* to the ordinary shareholders, with a preferential dividend of 10 per cent., should the shareholders assent to the resolutions which would be submitted to them for their approval at the extraordinary general meeting to be held immediately after the ordinary meeting. The Directors hoped the shareholders would avail themselves of this opportunity, by taking the quota allotted to them, of increasing their holding in so progressive, sound, and profitable an undertaking as the Ceará Gas Company.

Mr. J. DARELL BLOUNT, in seconding the motion, referred to the proposed increase of the capital. He said it was now nearly 30 years since the capital was fixed at £30,000; and, compared with other undertakings of the same nature, this was remarkably small. The reason for the capital being fixed in this way was to avoid the chance of a large expenditure upon works which would have handicapped the undertaking for many years—the feeling being that it was better to put up such works as were then necessary with the possibility of an increased demand for gas, and that any extension in the capital should be made by the shareholders themselves as the profits of the undertaking showed the value of the business they were engaged in.

The motion was carried unanimously.

On the proposition of the CHAIRMAN, seconded by Mr. BLOUNT, dividends of 5 per cent. on the preference shares and of 4 per cent. on the ordinary shares were declared for the six months ending June 30 last; making, with the interim payment, 10 and 7 per cent. respectively for the year.

Mr. A. J. KING proposed, and Mr. F. A. WALLROTH seconded, the re-election of the retiring Directors (Messrs. J. Darell Blount and F. W. Brothers). This was agreed to; and Mr. Magnus Ohren was afterwards re-appointed to the auditorship, on the motion of Mr. G. DANNATT, seconded by Mr. J. HART.

This concluded the general business

An Extraordinary Meeting was then held for the purpose of passing resolutions authorizing the proposed increase of capital.

Mr. E. K. BLYTH (the Company's Solicitor) said, before he read the resolutions, he should like to remind the shareholders that the original capital of the Company was £30,000, divided into 3000 ordinary shares of £10 each; and that, by a resolution passed in June, 1874, an additional £10,000 of preference shares were created with the particular privileges and rights described in the resolutions passed at that date. The capital was, therefore, now £40,000. The proposition of the Directors was to increase it by the creation of 2000 £10 shares, and issuing one-half as 10 per cent. preference shares, which would rank subsequent to the 10 per cent. shares already created. The resolutions were as follows:—"(1.) That the capital of the Company be increased by the creation of 2000 new shares of £10 each. (2.) That 1000 of such new shares be issued with the following rights and privileges—that is to say, that the holders of such 1000 new shares shall be entitled to be paid in each year out of the net profits of the Company for such year in priority to the holders of the ordinary shares of the Company, but after payment to the holders of the existing preference shares of the dividend to which they shall for the time being be entitled, an annual dividend at the rate of 10 per cent. per annum, and no more, on the amounts for the time being paid upon such new shares. (3) That the Directors be and they are hereby authorized, as and when they think fit, to offer the whole or any part or parts of such 1000 new shares to the ordinary shareholders of the Company in proportion to the existing ordinary shares for the time being held by them, and any such offer shall be made by notice specifying the number of shares to which the shareholder is entitled; and the Directors may in such notice, or subsequently thereto, fix a time within which the offer, if not accepted, shall be deemed to be declined, and after the expiration of the time so fixed, or on the offer being declined by the shareholders, the Directors may dispose of such 1000 new shares or the residue thereof in such proportions, at such time or times, and at such price not being less than par, as they shall think most beneficial to the Company." Mr. Blyth further explained that the first preference were cumulative shares; but the second preference were not. This was covered by these words: "The holders of such 1000 new shares shall be entitled to be paid in each year out of the net profits of the Company for such year."

On the motion of the CHAIRMAN, seconded by Mr. BLOUNT, the resolutions were agreed to without discussion.

The services of the Chairman and Directors and the officers having been duly recognized, the proceedings terminated.

BUENOS AYRES WATER SUPPLY AND DRAINAGE COMPANY, LIMITED.

A General Meeting of this Company was held last Tuesday, at Winchester House, E.C.—Mr. H. R. GRENFELL in the chair. The circular calling the meeting stated that several grave difficulties had arisen both between the Company and the Government and between the Company and their contractors, and the Liquidators could not disguise from themselves that, should they endeavour to enforce the strict rights of the Company, the assets would be exposed to the risk of serious diminution; and having regard to all the surrounding circumstances, they recommended the preference shareholders to authorize the surrender of the funding bonds upon the terms of a letter received from Messrs. Baring, Brothers, and Co. This letter stated that the writers understood a meeting of the preference shareholders was to be held to pass a resolution agreeing to give up the funding bonds of the Argentine Government (representing the two instalments of interest due in January and July last on the bonds which were to be given by the Argentine Government as the purchase price under the recission contract), with all coupons payable subsequently to Oct. 1, 1892, provided Messrs. Baring could arrange that, out of the first bonds which the Liquidators might receive from the Government, £3,000,000 be distributed among the preference shareholders within four months from the date of meeting. They promised to make arrangements which would ensure that, if the funding bonds were employed for that purpose, the distribution should be made.

The CHAIRMAN said that the shareholders would have learnt, from the circular convening the meeting, something of the terms which the Liquidators advised them to accept as a final winding up of the enterprise as far as the English shareholders were concerned. For the purpose of the recission of the concession, two bargains were made—one with the Argentine Government, and the other with the contractors. They contracted with the Government to finish the works; and they agreed with the contractors that the works should be so finished, without any expense being incurred beyond the amount set down in the agreement. They had, however, found to their cost that, while, on the one side, the Government were ready to stretch the letter of the law to the utmost in the Company's dealings with them, the state of the contractors' affairs rendered it impossible to enforce their claims upon them for the completion of the works. From information the Board had received, the Government were sincerely desirous of getting the works finished. It was therefore now proposed that they should accept that which the Directors had reason to believe would be offered by the Government —viz., that they should deal with a responsible contractor other than the Company, who would accept their liabilities; while, on the Company's side, they were willing to pay something out of the bonds to the new contractor. They were informed that the new contractor who was willing to stand in their shoes was Mr. Medici, who had been the sub-contractor all along. According to their contract with the Government and the old contractors (Messrs. Hale), the Company had to receive bonds for £6,324,300, of which £3,000,000 was to be distributed among the preference shareholders, £2,726,000 to go to the holders of debentures, and £588,000 to the contractors for the completion of the works. This last sum had proved insufficient to finish them; and the circumstances in which they found the contractors prevented the Company enforcing their rights. To get out of the difficulty, it was proposed they should hand to Mr. Medici

two coupons, amounting to £150,000 in paper, which, at the rate of 60, would be £90,000 in cash. With contributions from others, this sum would be sufficient to enable Mr. Medici to complete the works; and, at the same time, would give him a proper amount of profit for assuming responsibility towards the Government. The effect of this would be that the shareholders would have a £10 5 per cent. bond, to be redeemed by drawings in 37 years, in exchange for every £10 share. He moved a resolution carrying into effect the proposals of the Liquidators.

Mr. DRABBLE seconded the motion.

Mr. E. K. BURSTAL inquired whether the shareholders were to understand that Messrs. Hale were in such a pecuniary position that they were unable to complete the works, because they were now told that the sub-contractor of that firm was a man of considerable means. The Argentine Government appeared to press the Company from time to time to complete works of the nature of which the shareholders knew nothing. He characterized the Government as an unstable one; and said the shareholders were now asked to agree to something without even their written agreement. If the affairs of the Company were bad in the first instance, in his opinion they were worse now.

The CHAIRMAN said that Messrs. Hale's circumstances were perfectly notorious; and, with regard to the sub-contractor, it was the Government and not the Company who would have to put their confidence in him.

Mr. BAKER moved an amendment to the effect that the preference shareholders, in agreeing to the proposals now made by the Liquidators, only did so on the distinct understanding (to be embodied in a paper to be drawn up by Messrs. Bompas, Bischoff, and Co., and approved by them) that the stock to be delivered to the shareholders—viz., £100 for each ten shares—should be delivered from the first bonds received from the Government, free from any further liability, and within a period of four months.

The CHAIRMAN accepted this amendment; and after Mr. S. A. RALLI, Colonel DAVIDSON, and other shareholders had addressed the meeting, it was carried *nem. con.*

This concluded the proceedings.

MR. PICKARD ON THE LEEDS CORPORATION GAS COAL CONTRACTS.

Some comments appeared in the leading columns of last week's issue on a speech delivered by Mr. B. Pickard, M.P., the President of the Miners' Federation, at a meeting at Barnsley the previous Saturday. The portion of the speech in which we were specially interested was that referring to the gas coal contracts of the Leeds Corporation; and his remarks thereon were as follows: The coalowners are at it again. The revelation made three days ago by Alderman Gilston, as Chairman of the Gas Committee of the Leeds Corporation, that they had contracted for gas coal at 6d. to 7d. a ton below previous contracts, shows at once that, though coalowners may complain that they cannot get fair prices for certain classes of coal, they wilfully and persistently lower the prices of coal to gas companies and others, who are more than able to pay a fair price for the coal they require. When this question is looked at from the standpoint, to whom should cheap coal be sold? there is no excuse whatever for any salesman at any colliery reducing this class of coal. Gas companies throughout the United Kingdom are paying dividends as high as the law will allow, and bonuses—evading the letter and the spirit of the law, where such payments are possible—while corporations scarcely know what to do with the money now they have made it. Yet they at Leeds are exulting in the cry of cheap gas coal, while working men throughout the country are starving, if the complaints which are made in South Wales, and re-echoed in some parts of Yorkshire, are true, that the men are only able to work short time, in consequence of the owners being unable to sell coal at profitable prices. With such prices as the gas companies are more than able to pay, the Leeds Corporation, instead of wanting to banter down coalowners, ought to pay according to what they have agreed to pay—fair contracts and Tades Union rate of wages. How in the world can such corporations consistently squeeze coalowners in their prices, and expect them to pay Trades Union rates of wages to their men? Now, Mr. Marsden and Mr. Demain, what have you got to say to the Leeds Corporation in this unfair attempt to lower miners' wages? They must be aware, as ratepayers, in Leeds, that if they pull down miners' wages, the miner will have less to bring to Leeds tradesmen week by week; and this will put Leeds tradesmen in a bad position to pay wages. If Leeds tradesmen cannot afford to advertise because of low takings, we ask you, as men believing in Trades Unionism, expecting men to buy only at Trades Union shops, what you have got to say to the Leeds Corporation in a matter of this kind? However, all this, to a large extent, is beside the question. Trades Unionists connected with the miners have only to say that there is no need to reduce the price of gas coal or coal to railway companies, smelters, or persons engaged in any of the great industrial departments. If such is done, there is only one thing to say over again, that the miners will not submit to any reduction of wages brought about by any such evil competition.

Unemployed Gas Workers.—Already, at the first indication of the approach of cold weather, apprehensions are being experienced of a hard time for all classes of labourers during the coming winter. Among others to show signs of alarm are the officials of the Gas-Workers' Union, the members of which organization total up to about 80,000, one-half of whom are in London. Early last week the Assistant-Secretary (Mr. W. H. Ward) stated at a meeting that an exceptionally large number of them were already without employment. In previous years they had always looked forward to the winter months as a time when a large percentage of their members would be busily employed at the gas-works; but now, owing to the constantly increasing use of the electric light and of oil gas, fewer men would be wanted. The principal sufferers, however, would be the dock and river-side labourers, of whom there were many belonging to the Union. Even now they were doing very little work, and in a short time would be unable to get any.

MANSFIELD CORPORATION GAS SUPPLY.

Loss on the Last Financial Year's Working.

At the Monthly Meeting of the Mansfield Town Council on Friday, the 21st ult., the Chairman of the Gas Committee submitted their report for the year ending March 25 last. In doing so, he stated that there had been a loss on revenue account of £1060, and that the Committee had instructed the Manager to see whether he could not suggest some reduction in the working expenditure, and also to estimate the loss likely to occur in the revenue account for the current year. He believed that, during the past two years, they had been selling gas below the cost of manufacture; and it appeared to the Committee that the price would soon have to be raised. Mr. White remarked that, if the price of gas were increased, there would be a great outcry, and many consumers would discontinue using it. He proposed that the opinion of some independent expert should be obtained as to the condition of the works, and that he should report on the best steps to take to obviate the deficiency upon the undertaking. Mr. Butler seconded the proposition, observing that the matter was partially a legacy from the Commissioners. Mr. Crampton pointed out that, if as had been stated, there was an increase in salaries equivalent to ½d. per 1000 cubic feet, this alone meant an additional £120 per annum. Alderman Alcock said the Commissioners managed the gas-works until they built up a reserve fund of £2900, which was within £100 of the highest amount it could stand at. During the last two years, everything had been against the undertaking. The price of coal had gone up, and so had wages; but he did not think anyone who saw the work which the gas stokers had to do would say that they were too highly paid. Mr. Pegg maintained that the gas undertaking was now practically paying its way; the loss having arisen in the first half of the year. Mr. White's proposition having been adopted, Mr. Wilkinson moved, as an addition to the minutes, that a return be made of the quantity of gas sent out of the works during the twelve months ending May 18, 1892, and during the first year after the undertaking was purchased by the town. This motion was accepted; and the minutes were then adopted.

LEEDS CORPORATION GAS AND WATER DEPARTMENTS.

In an article dealing with the work of the Leeds Corporation during the past official year, the *Leeds Mercury* gives some particulars concerning the operations of the Gas and Water Committees.

Referring to the Gas Department, our contemporary makes the following remarks: The importance of the efficient lighting of a large manufacturing town cannot be overestimated; and the task of managing the vast gas-works in Leeds requires skilful hands. That it has these there can be little question, to judge from the excellence of the article supplied, and the cheapness of its cost as compared with other towns. The quantity of gas made during the last official year was 2,403,473,900 cubic feet, as against 2,411,931,900 feet in the previous year—a decrease of 8,458,000 feet, or 0·35 per cent. The coal and cannel used during the same period amounted to 243,904 tons, as compared with 240,587 tons in the previous year, showing an increase of 3317 tons, or 1·37 per cent.; while there has been a decreased production of gas of 8,458,000 feet, or 0·35 per cent., as before stated. The quantity of gas sold has been 2,119,012,000 feet, as against 2,103,221,000 feet in the previous year—the increase being 15,790,900 feet, or 0·75 per cent. The leakage in distribution, including gas used at the works, has been 11·83 per cent., as against 12·83 per cent. during the previous year. Gas used on the works is estimated at about 1¼ per cent. During the year there have been 12,836 yards of new mains laid for the supply of new streets, and 4834 yards, varying between 3 and 30 inches in diameter, have been laid in substitution for smaller and defective mains; the total quantity being slightly over 10 miles. There have been 3415 meters fixed for the supply of new customers, and 2040 meters have been brought in "not wanted;" while 7265 meters have been exchanged. The meters repaired have numbered 6817 of all sizes, as compared with 7323 in the previous year. The resolution of the Gas Committee that all meters should be brought in and tested once in ten years is being carried out; and it will be seen that there has been an increase in the cost per meter, as compared with the corresponding period, as follows: Total meters repaired during the year ending June 30, 1891, 7223, at a cost of £2018 4s. 11d.; total meters repaired during the year ending June 30, 1892, 6817, at a cost of £1952 19s.; or an average cost respectively of 5s. 6⅛d. and 5s. 8⅜d. The revenue account has been charged with £10,093 9s. 1d. on account of the sinking fund, which on March 25 last, had accumulated to the sum of £212,686 19s. 10d. The revenue account shows a deficiency of £3616 13s. 1d. on the year; but this, by the debit of £10,093 9s. 1d. for sinking fund purposes is raised to £13,710 2s. 2d. As compared with the corresponding year, there has been an increased income from gas and meter rental amounting to £2260 6s. 8d.; a decreased income from coke of £3789 19s. 10d.; an increase from tar of £783 3s. 6d.; and a decrease from ammoniacal liquor of £1269 14s. 4d. Gas-stove rents have produced £706 17s. 8d. On the expenditure side of the account, under the head of gas manufacture, which includes cost of coals, there has been an increase of £9666 4s. 5d., of which £8473 8s. 7d. was attributable to the increased cost of coal, the result of the Durham strike. The capital account has been enlarged by the sum of £14,939 16s. 8d. The average illuminating power of the gas and the sulphur impurity during the year, according to the tests made by the Borough Analyst (Mr. T. Fairley), has been as follows: Illuminating power, tested by the 24-hole Argand burner, 19·17 candles; sulphur impurity, 16·75 grains per 100 cubic feet.

With regard to the water-works, during the financial year they yielded a net profit of £25,000, of which £16,000 has been paid into the sinking fund, still leaving the handsome balance of £9000, or £3000 more than in the previous year. The total expenditure on the capital account is £1,670,077; and the debt is now £1,568,147—it having been reduced by sinking fund operations

to the extent of £109,298. In addition, however, the Committee have invested in good sound securities, such as corporate bonds in other towns, to the extent of £110,000; and this sum will ultimately be applied to the reduction of the debt. The number of houses, &c., supplied with water during the year has been 89,755, or 5735 more than in 1891. The work in connection with the reservoir at Eccup has been very trying; but it is pleasing to state that the leak, having been found and bottomed, there is no doubt now of the ability to make the reservoir sound, while its holding capacity when concluded will have been increased by a depth of 15 to 20 feet. Suggestions have been made that this reconstruction and enlargement should be paid for out of capital; but if this were done, the Government would make some difference in the number of years which the Corporation would be given in which to pay the cost of reconstruction. For instance, the present capital account of the water-works is paid for in fifty years; and possibly the reconstruction account might be only allowed thirty or forty years. But supposing only this number of years was allowed, and as much as £100,000 were spent on this reconstruction scheme, £5000 per annum would pay that amount off, principal and interest, in thirty years. Now the profits on the water-works, after paying all expenses, average far more than £5000 yearly; and everything points to a considerable increase in the next few years. So that there is no possible chance of any charges being made upon the rates for making good the defect at Eccup. Even if the reconstruction of the reservoir should cost £100,000, the Leeds Water-Works are so good a property that, including the paying off of that sum, there is to-day, and will be to a greater extent as years go on, many thousands of pounds profit.

BRADFORD CORPORATION ELECTRICITY SUPPLY.

Additional Borrowing Powers—The Cost of Lighting the Town Hall Clock.

A Special Meeting of the Bradford County Borough Council was held last Tuesday, when Alderman F. Priestman moved the adoption of the minutes of the Gas and Electricity Supply Committee, which included a provision granting borrowing powers to the amount of £30,000 for the extension of the electricity works. Referring to the matter, he remarked that he had almost said the amount was so small that it was not worth his while to mention it. The fact was the Committee required something like £9000 to complete portions of the electricity works already sanctioned by the Council. The remaining money would probably be required for an extension in years to come; but there was nothing of the sort coming up just at present. In fact, the Committee had no intention of recommending extensions of merely prospective utility. The public were continually demanding increased supplies of electric light; and, of course, the Committee would need capital if they were to cope with the growing demand. He hoped to see the day when they would have to come before the Council to ask for five times as much money as they now needed; and he trusted that the supply of electricity was going to be a distinctly progressive work. Mr. J. Kay seconded the motion. Alderman Smith Feather asked Alderman Priestman whether he could suggest any means of reducing the cost of electricity. He had in his mind particularly the electricity supplied for the purpose of lighting the Town Hall clock. He understood that this supply alone cost £840 a year, which was an enormous amount. Alderman Priestman expressed great astonishment at hearing the cost of illuminating the Town Hall clock. Still, he said, as Chairman of the Gas and Electricity Supply Committee, he had no interest in reducing the amount that a very good customer might choose to spend. He would remind the members of the Council that the money was in effect simply transferred from one pocket to another, and that, therefore, there was no great issue at stake. The matter was one which really belonged to the Finance and General Purposes Committee; and no doubt the Chairman of that Committee had already considered as to what was the best course to take. There were many ways of reducing the cost of the illumination. Personally he was often puzzled to tell the real difference between the 8-candle, the 16-candle, and the 32-candle lamps. Perhaps the 32-candle lamps in use might, without inconvenience, be changed for 8-candle ones, or, on the other hand, the total number of lamps might be reduced. The minutes were approved.

AN ELECTRIC LIGHTING MUDDLE AT WINDSOR.

Some correspondence has recently been passing between the Windsor Town Council and the Board of Trade, and the latter body and Messrs. J. E. H. Gordon and Co., electrical engineers, respecting the powers of the Windsor and Eton Electric Light Company. It appears that, according to clause 7 in the Company's Provisional Order, before exercising any of the powers conferred upon them in relation to the execution of works, they were to show, to the satisfaction of the Board of Trade, that they were in a position to fully and efficiently discharge the duties and obligations imposed upon them by the Order; and by clause 21, they were, within a period of two years after the commencement of the Order, to lay down suitable and sufficient distributing-mains throughout the streets specified in the second schedule. Some months back the Company applied to the Board of Trade stating that they were prepared to do certain parts of the work required, and asking them not to express any dissatisfaction at their not being in a position to carry out the work over the whole area. A copy of the application was sent to the Town Council, who referred it to the Streets Committee. That Committee reported twice on the subject; and each time it was referred back for further consideration. They again reported, recommending the Council to reply that they had no objection to the Company laying down distributing-mains in the streets named in their application, provided that the Board of Trade were satisfied that they had sufficient capital and means to carry out the work, and to continue the supply of electricity for a reasonable period, and further that conditions should be affixed compelling the Company to lay down distributing-mains and supply electricity over the whole area of supply within a fixed time. A copy of this report was forwarded to the Board of Trade, who replied that the Compan had not complied with the provisions of section 7 of their Order; and they also enclosed a letter from Messrs. Gordon and Co., which showed that they had the whole of the necessary machinery in an advanced state of manufacture, and that they hoped to commence the buildings at the end of the present month, and to start the lighting in the first week in December. On Sept. 21, the Company sent a month's notice of their intention to proceed to lay down the distributing-mains; and on the 14th ult., the Town Clerk addressed a letter to the Board of Trade, inquiring what steps they should take to prevent the streets being broken up. To this the Board replied that they were unable to advise the Corporation; but the undertakers did not appear to be in a position differing from that of other persons who desired to break up the streets under the control of a local authority. The whole of the correspondence came before a meeting of the Town Council last Wednesday week, when, after a protracted discussion, the following resolution was agreed to: "This Council regret that the Company have not satisfied the Board of Trade that they are in a position to fully and efficiently discharge the duties and obligations of the Provisional Order; but, in order not to prejudice the action of the Council in future, the Town Clerk give notice to the Windsor and Eton Electric Light Company, under section 14 of the Order, that the Council disapprove of the Company opening and breaking up any of the streets or highways, or commencing any other works, until they have satisfied the Board of Trade, as required by section 7 of the Provisional Order." It was afterwards also agreed that a Committee of the Council should be appointed, composed of members not interested in the local gas or electric lighting companies, to confer with the Directors of the Electric Lighting Company—the proposer remarking that he suggested this in the hope that they would be able to come to some agreement, and to show their sympathy with the Company, and that they did not wish to place obstacles in their way.

THE WATER QUESTION AT CHESTER.

Proposed Inquiry into the Quality of the City's Supply.

The Joint Committee on the Water Supply of Chester held a private meeting last Thursday week; and it is stated that the proceedings were by no means as harmonious as could have been wished. The Duke of Westminster presided, and opened the meeting by proposing that the Local Government Board should be asked to institute an inquiry as to the purity or otherwise of the water supply of the city, so as to settle the question once for all. The Bishop of Chester seconded the motion. The Town Clerk (Mr. S. Smith) pointed out that a Local Government Board inquiry would mean delay; and he suggested that the meeting should select a gentleman to make the inquiry, and the Corporation would be quite willing to pay the cost. The matter was under discussion for fully an hour, when his Grace said he should not put his resolution to the meeting, because the opponents to it had been made so numerous that it would certainly be outvoted; and he and his colleagues shortly afterwards withdrew. The Public Meeting Committee subsequently had a private meeting, and decided to report to the General Committee appointed by the public meeting that, inasmuch as they could make no terms either with the Corporation or the Water Company, they recommended a petition to the Local Government Board for a public and independent inquiry. The Committee of the Corporation also held a meeting, at which it was resolved to call a meeting of the Council as a General Purposes Committee on the following Wednesday. This was done; and, at the commencement of the proceedings, a letter was read from the Water Company, in which the Directors stated that they did not think it well at this time to attempt to deal with the many gross misstatements which had been put into circulation as to the River Dee (to which residents would attach their true value), or as to the other matters affecting particularly the action of the Company, though at a suitable time these statements might readily be refuted. They were more desirous of facilitating some practical action in this matter, and were wishful to the utmost of their power to promote the interests of the city by any possible improvement in the water supply. With this view, they made three suggestions, having as their object the removal of the objections which had been made to the present supply—(1) The possible improvement of the system of filtration by the adoption of one of the several processes now in operation in some other places, the process most commending itself being that known as Anderson's patent revolving purifier; (2) by seeking a supply from deep wells; (3) by removing the source of supply to a point further up the river. After discussing the two first suggestions, the letter said on the remaining suggestion the Board had consulted Mr. H. E. Taylor, who had laid before them a proposal to remove the intake to a point a short distance above Farndon. This plan appeared to them to promise greater advantages than the others, ensuring, as it must, perfect safety from any pollution from "down stream," and also, it was believed, equal safety from contamination from higher reaches. It would involve a very large, possibly an absolutely prohibitory, expenditure of capital, and in all likelihood an application to Parliament for additional powers. To provide a commensurate return on this capital, it would probably be necessary to ask for the right to a rate for water supplied to the Infirmary, for street watering, and for the extinguishing of fires, &c., all of which was now supplied gratuitously. The Board desired to press upon the Town Council the immense importance of their undertaking, so far as in their power, the purification of the river; and as a first step in that direction, the removal from it of the sewage now increasingly brought into it. They also urged that the Council, in compelling the conversion of privies into closets throughout the city, to a very great extent had been the cause of the outcry raised by certain parties against the water. It had been abundantly proved that the water as supplied by the Company was healthful, good, well filtered, and (except in time of flood) clear and bright; and the Directors considered the present agitation to be mainly sentimental, and very injurious to the interests of the city. The Committee, after a lengthened discussion, resolved—"That the Committee appointed at the last meeting of the Council do institute an inquiry as to the satisfactoriness or otherwise of the water supply of the city, and take such advice as they may deem necessary, and report as early as practicable on the whole subject to the Council.

THE METROPOLITAN WATER SUPPLY COMMISSION.

(*Lord* BALFOUR OF BURLEIGH, *Chairman*; *Sir* G. B. BRUCE, *Sir* A. GEIKIE, *Professor* DEWAR, *Dr.* W. OGLE, *Mr.* G. H. HILL, *and Mr.* J. MANSERGH, *Commissioners*.)

Twentieth Day—Wednesday, Oct. 19.

To-day the Commission commenced the hearing of geological evidence.

Mr. *W. Topley*, F.G.S., was recalled, and, in answer to the CHAIRMAN, said he had prepared a statement showing the water-bearing qualities of the rocks in the basins of the Thames and Lea, and also a supplementary paper referring to reservoir sites in the Upper Thames Valley. Asked to explain the length of time and the circumstances under which he had studied the geology of the Thames and Lea, witness stated that for thirty years he was connected with the Geological Survey; and his main work in the South of England was in the south-eastern part of the area around Kent, Surrey, and the Weald. As he had resided at Croydon for some years, he had had abundant opportunities of learning the geology of the locality; while part of the district he had surveyed was in Hertfordshire, in the valley of the Lea. He produced a series of elaborate maps, showing the geological features of the Thames and Lea Valleys, and described three main drifts. One of these was an impervious bed of clay; another, of clay mixed with sand and loam, through which the water partially percolated, and helped to feed the chalk underneath (the proof of which was that the chalk was irregularly piped, showing that the water had come down); while the third drift, over the chalk, was partly pervious, and had to be reckoned with the chalk itself.

In reply to Sir A. GEIKIE, witness said the areas upon which he more particularly wished to give evidence were those lying to the west of the Colne, and west of the county of Kent. One point to which he would call attention was the distribution of the chalk rock. He did not know of any well, yielding a very large quantity of water, which was sunk below this rock. All those near London were, of course, sunk in the upper chalk; and those in the outskirts were exceedingly productive. As regarded the drifts over the chalk—they comprised the over-clay, which was rather impervious, and clay mixed with flints—sometimes clayey, and sometimes sandy. The water percolated through these drifts, and helped to feed the currents underneath. The chalk was very irregularly piped, and it wound in and out among the valleys, and covered the high ground; and the whole of this surface practically drained towards the chalk. If the rain did not go directly into it, it ran off, and eventually reached the chalk. Therefore, although this area might be considered as diminishing the percolation to the chalk, it only did so to a very small extent. He knew of a case where the sewage of whole towns was carried down through the beds of the chalk, although it was many years ago; but it afforded an illustration of what could be done in carrying the water artificially into the chalk, and it showed that there was a possibility of increasing the natural supplies of water in the chalk by artificial wells or holes. One of the best cases of a stream disappearing in the chalk was to be found at Mimms, south of Hatfield, where the drainage of about 20 square miles, which ought to go into the Colne, passed into swallow-holes, and so into the chalk, eventually finding its way to the Lea. In such a case, the natural drainage of the district was, of course, interfered with. There was another instance of practically the same kind upon a small area on the western side of the Lea basin, just east of Northaw. This was a very common case in limestone districts, though the water did not usually go into another area. His suggestion was that there were many places where this natural action could be artificially imitated, perhaps by sinking wells; for he thought it quite possible that water could be let down in this way into the chalk. Of course, it might be that the water would not get freely away when it reached the chalk. For instance, where galleries were driven into the chalk, fissures might be met with where the water could run away; and therefore it would be necessary to make experiments with regard to this. There were several places in the course of the River Lea where he thought wells might be sunk—necessarily along the line of saturation; and for these he recommended that a special survey should be made. As to the necessity of sinking wells above the chalk rock to yield any large quantity of water, there were two reasons for this. Perhaps the main one was that above the rock there were flints, whereas there were none in the districts below; and they found that water naturally travelled through fissures in the chalk, though, on the other hand, a large fissure might be found in the lower chalk. Although the outcrop of the chalk rock would limit the places where wells should be sunk, he did not say that under no circumstances should water be taken from the lower chalk; because the wells would saturate the whole of the chalk, and such fissures as there were would go down through it. Speaking generally, he would always make the artificial wells above the chalk rock; but there were places where the superficial area was shifted, and where they might not do so. He had investigated the question of percolation in relation to underground water supply. He had not, however, made any percolation experiments himself, but had taken the evidence available, and considered what could be done with it. Very frequently there was no percolation through the soil, whereas it was very great through the sand. Where the soil was quite bare, the percolation was greater; and it was very often supposed that this to a certain extent vitiated the experiment as regarded percolation in relation to water supply. He thought a important point to be taken into consideration was the large area of arable land that was ploughed, and consequently perfectly bare of crops, at a time when the percolation was greatest. These percolations were found to be much less in summer than in winter. Asked what was his own impression as regarded the average amount of percolation into the bare chalk—whether or not it varied with height—witness said he did not know what the proportion was; but the rainfall varied very much with height, and a great deal of the high ground chalk was bare, sometimes on the summits, and sometimes on the sides and escarpments. The rainfall being great, there was every chance of a larger quantity of water going in than was generally allowed for. Mr. Symons had stated that 975 square miles of the Thames basin above the Water Companies' intakes had a mean rainfall of 32 inches; and there must, he (witness) thought, be a large area of gathering-ground with an average fall of 30 inches. It was possible that there were defects in the gaugings and different ways in which they might be interpreted. One-third of the rainfall, whatever it was, percolated; he did not think they could take less than that. In his opinion, the ordinary estimates were rather under than over the actual facts. There was very good evidence that they were under. These experiments were useful for comparison, inasmuch as it was known that the percolation into the ground was much in excess of what percolating experiments demonstrated; a larger amount of water coming out of the chalk than they could show had gone into it.

Sir A. GEIKIE asked witness to give the Commission the result of any attention he might have paid to the relation, if any, between the springs coming out of the chalk and the pumping.

Witness, before going into that, stated another reason why he thought the percolation was under-estimated. It had reference to the large amount of moisture in the air. It was calculated that the ground itself was fed by condensation from the atmosphere; and one did not see how the rain-gauges could take account of this. Then there was the important evidence of Sir E. Easton, in which he said, from his own knowledge, that the chalk of the Brighton area yielded two-thirds of the rainfall; and it had been estimated with regard to the chalk of Yorkshire that three-fourths of the rainfall went into the ground—a possible over-statement, however. Taking all the facts into consideration, he (witness) thought that one-third of the rainfall was a very small amount to estimate. To be on the safe side, however, he said he had, in his estimates, gone considerably below that; and it was quite sufficient for his purposes to assume that there was an average percolation of 7 inches over the chalk—8 inches over the bare chalk. Coming now to the question with regard to the relation of the flow of natural springs in the chalk and pumping, witness directed attention to the Chadwell Spring. The gaugings of that spring had, he remarked, been supplied to him by Mr. Francis, Engineer of the New River Company. From 1881 downwards, they had been taken pretty regularly about once a week; and it would be seen what a close correspondence there was between the amount of rainfall and the amount of percolation and the levels of the spring. But, knowing the large extent of pumping going on a short distance from the spring, he was very much surprised that it was not dried up. It was really wonderful that it should continue to run. The fact was that the main fluctuations of the spring were due to seasonal changes and variations of rainfall and percolation, not to pumping. It would seem sometimes that, when pumping was heavy, the level of the springs was low; but both circumstances were due to the same cause. When dry weather came, there was more water pumped from the wells; and during this weather the springs must go down. He was not aware of any peculiarities of geological structure in the Chadwell area that would account for the large volume of water coming up there. Questioned as to his remark about certain areas in the chalk not yet touched for the supply of London, he mentioned that the extent of these was 1005 square miles. They were touched only in a certain way—they fed springs which flowed into the Thames; and wells had been sunk to a very small extent in them. As to the possible quantity of water which these chalk areas above the intakes of the Water Companies absorbed, he had calculated that the base chalk, with some 8 inches of percolation, took about 228,000,000 gallons per day; and the other surfaces, 68,000,000 gallons—making a total of 296,000,000 gallons over the 1005 square miles. This was what went into the chalk; but what was to be taken out, was another thing.

In further reply to Sir A. GEIKIE, witness admitted that the lower greensand could be used to supplement the present water supply; but he said he did not look to that as an abundant source. It was supposed at one time that a considerable quantity of water could be obtained from it; but they did not find, as a rule, that wells sunk to the lower greensand did yield a large amount, which was due partly to the fact that the sand ran into the wells and choked them. But the lower greensand is a possible means of supplementing the supply. As to the question of reservoirs in the basins of the Thames and Lea, witness said he had seen the sites and made notes concerning them. No. 1, which was on the Windrush, above Burford, had a perfectly water-tight bottom. He did not see at all why the reservoir there should not be absolutely water-tight; and he thought it would be possible to find some excellent sites for reservoirs in that area. Then there were good additional sites—for instance, one just north of Banbury, with 12 square miles of gathering-ground. Witness's attention being again directed to his printed statement that it might be shown that the diminished flow of the Hertfordshire streams occurred before the extensive pumping took place in the Lea Valley, he mentioned that the evidence of this might be obtained from the records of the Hertfordshire people themselves. There was proof that the complaints now going on as to the decrease of water in the country were also made years ago, before any considerable pumping commenced. Of course, there were places where pumping had had influence locally; but there was no evidence whatever that the pumping did damage a long way from it.

Mr. MANSERGH: You speak of letting down water artificially into holes—bore-holes or wells. Would not that entail surface works of considerable importance, and interfere with the user of the land?

Witness said no doubt it would. But he did not anticipate that there would be a necessity for these artificial works, so very large was the quantity of water derivable from the chalk.

Mr. HILL: Would not the putting down of swallow-holes, which is suggested, materially interfere with the rights of parties who use the water now on the surface? I am not alluding to the works, only the water rights lower down the valley, if you intercept the water.

Witness: It probably would.

Mr. HILL next called witness's attention to the present descriptions of the reservoir sites in the Upper Thames Valley, and observed that some of them seemed to indicate rather doubtful sites. Witness admitted that he was of opinion that there was a considerable doubt as to two or three of them. It being pointed out to him that, in speaking of No. 2 reservoir—situated on the Sherborne, above its junction with the Windrush—he had remarked that the soil on the hillside was rubble,

but that it was naturally puddled to some extent on the gentler slopes, which he (Mr. Hill) thought was a very doubtful sort of matter, where they had pervious material below, witness agreed; but he said that the reservoirs, when in use, would puddle themselves. He also observed that he had said there was a possibility of the reservoir not holding water perfectly. But if it leaked, the water would flow partly into the basin of No. 1 reservoir, and partly into the stream to the south, in which the compensation water could be measured. He added that he put down No. 1 reservoir as the best. He had not the slightest doubt that it could be made practicable. He could not conceive why anyone should question this at all.

Reverting, at the instance of the CHAIRMAN, to the statement that 296,000,000 gallons of water, on an average, percolated each day to the chalk above the intakes of the Water Companies, witness explained that not all of this quantity was available for the supply of London, even if it could be taken out. A great deal of it went away as springs to feed the Thames. Reminded that, if he took that water out of the chalk above the intakes of the Companies, he would be to some extent depleting the Thames, he admitted that he would, if the water were drawn in large quantities. But what he thought was that one could pump a considerable amount at properly selected places without decreasing the flow of the river by the same bulk. He added, however, that he had never formed any idea as to how much came out of the chalk and supplied the dry-weather flow of the Thames in summer. Asked as to how he would bring the water to London after getting it out of the chalk, he said that he would convey it by pipes to elevations around London. The "selected places" of which he spoke would not be at a sufficient elevation for the water to flow to London by gravitation; the greater part of it would have to be pumped. Questioned with regard to a certain part of his printed statement, witness said he based it upon what he knew as a fact—that the depression of the water-level in the chalk under London was due to excessive pumping in that district. Asked if he had any theory as to why pumping should lower the level of the water there, and not affect it, except to a limited extent, in the areas outside, he observed that under London the water could not very well get away. It was under a great thickness of London clay; and the water evidently had great difficulty in travelling. There was plenty of water all around the pumping area in London. As to a probability of depleting such an area as the Lea Valley, just as the London area was being depleted, by taking from it a large quantity of water daily over a long series of years, witness said he did not think there was any, because there was no difficulty in the water getting down in such an area as the one referred to. It was shown already in the fact of the Chadwell Spring not being dried up. His theory would be that no pumping in the Lea Valley south of Hertfordshire could deplete any Hertfordshire wells far up. Returning to the alleged failure of the Hertfordshire springs and streams, and assuming the correctness of the allegation, he gave it as his opinion that the cause might be found in the alterations that had taken place in the modes of agriculture, in the draining of the land, in the cutting down of woods, &c.

In reply to Sir A. GEIKIE, witness added that, taking into account all the waters known to flow into the Thames, there was an accession to its volume; and this must be due to gradual soakage in the bed of the river.

In concluding his evidence, witness said it had occurred to him, as a matter worthy of consideration, whether the springs of the upland areas of the Thames and the underground storeage of the porous rocks could not be artificially increased by the construction of reservoirs which would slowly leak—whether it would not be possible to build a dam across, and allow the water to percolate through the porous rocks and come out in springs. The point one would require to be certain about would be whether these rocks would hold water long enough to yield a maximum supply during the dry weather.

Mr. MANSERGH: You wish to diminish the flood discharge, and increase the dry-weather discharge?

Witness: Increase the dry-weather discharge by making artificial springs in areas where there are none, and damming the water back to supply them.

Dr. *H. Woodward*, the next witness, said that, acting under the instructions of the Solicitors to the Thames Conservancy, he had considered the geological character of the proposed sites for storeage reservoirs, as suggested by Messrs. Marten and Rofe, and had visited the sites. That on the Windrush he thought was a most important one; and generally he considered the whole of the sites geologically suitable for the purpose. Those on the Glyme and Dorne, which had been criticized, he considered to be quite fit for reservoirs; and he believed that these could be made water-tight, judging from the large proportion of clay and limestone which characterized those valleys.

Mr. *H. Woodward* stated that he had been for 25 years engaged on the Geological Survey. In conjunction with the preceding witness, he had been consulted by the Thames Conservancy regarding the geological character of the proposed sites for the storeage reservoirs which had been suggested by Messrs Marten and Rofe. He had prepared a report on the subject, which he now submitted to the Commission. With regard to the proposed Windrush reservoir, he estimated the rock bed to be from 10 to 15 feet thick. It would, he thought, be a perfectly sound site. The floor of the Sherborne reservoir was partly limestone and partly sand. There was an alluvial coating over that, and a stiff clay in some places. In the bottom of the valley, there was also an alluvial deposit; and the sides were partially covered with rubble. He did not think this site was so water-tight as the others. Some of the water would get away; and a certain amount would be retained, but he would not like to say how much. Then the floor of the Cherwell River site would not be a very satisfactory basis; but if the water could be dammed up, it would be kept by the upper lias clay on the sides. There was no chance of the water escaping altogether from the reservoir; it would have to get through about 65 feet of the marlstone. Asked if he thought there was no chance of there being fissures by which the water would escape away from the puddle trench altogether, he said there might be, because water would travel through marlstone underground. There were, however, no faults there which would be of any consequence. In the Sor Brook site he did not think the marlstone rock anywhere touched the reservoir. In many of these places, the banks were all grass. This particular reservoir would be on a perfectly satisfactory site. On the River Swere, there were some faults. These, however, would not at all affect the structure of the reservoir. Any leakage was cut off by walls of clay on the side, so that it would be practically water-tight. The site on the stream near Deddington would, he thought, be a suitable one. With regard to those on the Dorne and Glyme, the upper parts of the beds there were about 30 feet thick, and composed mainly of a very porous limestone; but the rivers had found their way down to a better stratum. Beneath that rock there was an alternation of marlstone and limestone. The site on the Thame, near Hardwick, he considered to be an absolutely water-tight one.

In answer to Mr. MANSERGH, witness said these were not the only reservoir sites he had visited; but he had merely examined these in detail. The main part of the Sherborne reservoir was situated in porous beds.

Mr. HILL: Are the measures taken sufficiently definite to enable you to decide whether or not the reservoir could hold large quantities of water?

Witness: I have been examining the rocks, and know their general character. I think the streams might be turbid with clay in times of flood.

The CHAIRMAN: Did you examine the whole of the upper districts of the Thames and its tributaries, with the view of finding sites.

Witness: No; I have not been over the whole of the area. I went under the guidance of, and as geological assistant to, Messrs. Marten and Rofe, at their request, to give them information as to the nature of the strata in the different areas. I consider the sites are good in themselves as compared with the strata in other valleys; and I recommended them.

Mr. *R. Etheridge*, F.R.S., stated that he had been employed for some time on the Geological Survey, and had been subsequently in the Geological Department of the British Museum. He had prepared a paper on the upper reaches of the Thames and its tributaries; with special regard to their adaptability for the purpose of constructing water reservoirs; and he submitted it to the Commission. No basin was, he said, richer in springs of pure water than that of the Thames; and the springs from the oolitic rocks above Oxford, and from the chalk below Wallingford, furnished a very large proportion of the quantity of water in the upper and middle Thames area. Taking a minimum flow of 7 cubic feet per square mile per minute, 20,000,000 gallons of water passed over the weir at Lechlade before the river received 'the large accession of water derived from the Leach, the Bampton streams,' the Windrush, and the Evenlode. He had reason to believe that, from the oolitic rocks alone above Lechlade, the ordinary flow might be at least from 30,000,000 to 50,000,000 gallons per day; and this volume must be vastly exceeded at the time of the greatest productiveness, during the winter and early spring months. The total of the different rivers flowing into the Thames he estimated at 100,000,000 gallons per day.

Questioned by Sir A. GEIKIE, witness mentioned that practically all the information in his statement regarding the volume of water in the springs in the Upper Thames was not original, but was taken from reports; and that, as these springs went to feed the river, any diminution in their quantity would, without doubt, affect the flow of the stream. As to the sinking of deep wells, he had, he said, reason to believe that water would be found by doing so, as a vast quantity must at present escape below the fuller's earth. Concerning the construction of reservoirs, he had given it to be understood that these were to be formed by excavating in the clay.

In answer to Mr. MANSERGH, witness said that of the 100,000,000 gallons of water a day—the total addition to be obtained from the storeage reservoirs and the wells—he expected to get more than one-half from the latter; but he had no evidence to show how much could be drawn from a single well. If they assumed 3,000,000 gallons per diem from a single well, which would not be a bad supply, then possibly they would require 20 wells. As to how the water would be brought to London, this was a question for the engineers; and he had not considered it. He did not think the abstraction of a large quantity of water by means of the wells would have any effect upon the streams on the surface.

Professor *Boyd-Dawkins* was then recalled. He first explained the nature of his professional experience with regard to the areas of the Thames and Lea Valleys in their relation to an increased water supply. He said that for something like six or seven years he was employed on the Geological Survey, and for several years during this time he was engaged in mapping the tertiary areas in the neighbourhood of London in Essex, Kent, and Surrey. He had also been concerned in various inquiries into questions of water supply in and around the Metropolitan area at Dover, Maidstone, and Croydon. He had been asked to look into the present matter on behalf of the associated Water Companies and the Thames Conservancy Board; and especially on the part of the East London and New River Companies. Mr. Topley, Mr. Etheridge, and himself had met in consultation on the subject; and he, at all events, had agreed to take that section of the question with which he was particularly conversant—namely, the area of the Lea and that of the Kent Company, going as far west as the watershed between the Rivers Lea and Colne, and practically taking all the area to the east of Croydon.

Examined by Sir A. GEIKIE, witness pointed out that he distinguished most clearly between the upper and the lower chalk, for the following reasons: In the cliff sections—say from Folkestone to Dover and beyond—they had a clear exposure of the whole of the chalk formation. Up to the top of the grey chalk there was practically no water; but the moment they rose above this, they came into rocks which were gradually more porous and water-bearing. He took it that this porous zone was something like 400 feet—480 feet in the area of Dover, 400 feet in that of Croydon, and possibly only 300 feet in the area north of the Thames. This upper chalk contained from 2 to 3 gallons of water per cubic foot; that was its storeage—the water they could not pump out, or capillary water. Passing to the subject of percolation in the chalk area, witness expressed his opinion that 10 inches would be a fair average amount to take for the area of the chalk in the district of

which he spoke, though in some parts he thought this was much too small. According to Sir E. Easton, the amount of rainfall going into the 15 square miles of chalk at Brighton was not less than 13 inches; and the 8,000,000 gallons he mentioned as a minimum did not represent the amount of water which was actually finding its way through the chalk into the sea. Then there was the evidence of other gaugings; and it was important to note that the chalk not only absorbed into its pores, but obtained water through its pot-holes and fissures. The chalk, by means of its fissures and pores, was, he illustrated, taking up all the water it could get.

The further examination of the witness was postponed until the next day.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Corporation of Aberdeen have the peculiarity that, with the expiry of the Town Council for the year, the accounts of the Gas Department come up for consideration. This took place yesterday at a meeting of the Council, when Bailie M'Kenzie, the Convener of the Gas Committee, submitted his annual budget. The accounts showed that during the year ending on Sept. 30, the output of gas was 394,167,000 cubic feet; which is 27,260,000 cubic feet more than in the preceding year. Last year the Corporation retained the price of gas at 3s. 8d. per 1000 cubic feet; and the revenue derived was £74,360, of which £64,318 was from the sale of gas, and £9843 from residual products. Unaccounted-for gas rose from 8·15 to 9·56 per cent. The revenue from gas was £3701 above that of the preceding year. The coal account was £43,690, an increase of £11,649; the amount carbonized being 39,657 tons, at an average price of 22s. 3½d. per ton, as compared with 37,648 tons, at an average price of 17s. 10d. per ton in the preceding year. The total expenditure, including £3927 set apart for depreciation, was £67,961. There was thus a balance of £6398 upon the year's working; and a sum of £2980 was brought forward from the preceding year. The fall in residual products was from £11,500 to £9843. A sum of £8400 has been written off for depreciation and sinking fund purposes; and with this and other items, the balance of the account is reversed, so as to produce a deficit of £2711 on the year's working. The estimates provided for a deficit of £799; so that, when everything is taken into account, the results are far from being disappointing. To meet the estimates for the current year, it has been resolved to advance the price of gas from 3s. 8d. to 3s. 11d. per 1000 cubic feet.

The Paisley Gas Corporation discussed on Wednesday the question as to whether they should apply to the Board of Trade for power to borrow £20,000 for the gas-works, or whether they should defray all the charges connected with the improvement of the works out of revenue. Paisley is one of the places where the gas undertaking has been too prosperous. Under Mr. Hislop's management, the works have been carried on in so profitable a way, that the Corporation have not only cast longing eyes, but have laid appropriating hands upon the results, and in some years have seized as much as from £6000 to £8000 of the surplus for town improvements. It is, undoubtedly, highly creditable to Mr. Hislop that he has been able to provide the surpluses into which the Police Commissioners could dip their hands; and this is certainly a case in which the Corporation, having got hold of a capable servant, have worked him, to use sporting language, "for all they know." It is found to be necessary to increase the plant of the gas-works, in order to meet the increased output; and the Corporation, viewing the expenditure as extension and not renewal, have resolved to add the cost to capital, and not to defray it out of revenue. In this they are certainly right, provided their other accounts are in proper order; and of that there can be no doubt, because the Corporation, starting with an indebtedness of £128,000, have been able, in little more than 20 years, to reduce it to £75,000—all the time keeping the price of gas at a figure which, for Scotland, is decidedly low. The price in Paisley is 2s. 10d. per 1000 cubic feet for 27-candle gas, which is, to say the least of it, a marvellous performance by the Gas Manager. No other place in the United Kingdom approaches to Mr. Hislop in the results he obtains. Certainly, if ever there was a case in which the Corporation might appropriate gas profits, it is in Paisley, where the community have not suffered by the act; but the other side of the question is that, if the Corporation had reduced the price of gas by 3d. per 1000 cubic feet a few years ago, what might not the output have been by this time? An increased output would have meant an increased outlay upon works; and this the Corporation seem to have avoided, by keeping the price of gas higher than it should have been. Whether this is a wise policy or not, it is for the Corporation to determine. They have decided that it is; and Mr. Hislop has helped them to carry out their policy. On Wednesday, they agreed to add £20,000 to their capital, which, if the same success attends them as they have experienced, they will never feel as a burden. Altogether, the finances of the Gas Corporation are an enigma, if one leaves out of account the personality of Mr. Hislop. With it, the whole situation is explained; it is he (not members of the Corporation) who has brought them into the position they occupy.

The manufacture of gas-meters in Edinburgh continues to flourish. Mr. Jack, the Inspector of Meters, in his annual report to the Town Council for the year ending at July 31 last, states that during the year 38,608 meters were tested in his department, of which 16,709 were wet, and 21,899 were dry meters. The fees drawn amounted to £1238 13s. There was an increase of 2037 in the number of meters; and of £22 13s. 6d. in the amount drawn. Of the total meters tested, 38,294 were found to be correct, and 314 incorrect. Since 1861, when the city adopted the Sale of Gas Act and opened the department, the total number of meters tested has been 1,121,697; and the fees drawn have amounted to £34,116 3s. In 1861-62 there were 37,605 meters tested—35,923 wet, and 1682 dry meters. Last year the proportions were, as stated above, 16,709 wet, and 21,899 dry meters.

While I write, Scotland is virtually without municipal government. The old order of things has passed away; and it is about to give place to the new, which comes in with the 1st of November, on which day the selection throughout the country take place. There has been, during the past two weeks, a great deal of "blowing of bagpipes" throughout the country by candidates, of the usual sort with which one is familiar on the part of men who are anxious to secure a seat at the Council table. The stuff that is talked on such occasions is, of course, quite ephemeral, and very frequently altogether foolish. This afternoon, I had the pleasure of listening to an open-air harangue by one of the aspirants to office in Edinburgh. He was addressing the poorer section of the community; and he sought to curry favour with them by declaiming on what he considered the injustice of making one of the residents in every common-stair responsible for the collection of the money which is charged for the lighting of the stair. He said, however, that the iniquity was about to cease, because the Corporation were to undertake that duty themselves. I am afraid he was speaking without book; for, as I read it, all that has been agreed to be done by the Corporation is to see that the lamps are lighted and extinguished. As a matter of fact, at the last meeting of the Town Council, on Tuesday, instructions were given to the Inspector of Lighting to take proceedings against those persons who do not attend to the extinguishing of the lights between this and the time when the Corporation are themselves to take over the work. The proposal was objected to by one of the members, who usually poses as the poor man's friend, on the ground that this meant the prosecution of some 1100 or 1200 persons; and the Lord Provost himself deprecated the dragging of scores of respectable people to the Police Court as criminals for such an offence. It was explained that it was only intended to prosecute a few persons, as an example; and the Council gave the necessary authority. What their final arrangements may be, I cannot tell; but the step they have taken is a sensible one. Whether there be "injustice" or not in the present arrangement, it should be enforced while it exists. On the other hand, if the Council intend to relieve all and sundry of all burdens in connection with the lighting of private property, it would be in bad taste to begin now to be strict, when it is remembered how lax they have been hitherto in the matter.

I mention, as an incident connected with the elections, that Mr Adam Pratt, who was such a bother in the Aberdeen Town Council for three years upon gas questions, and who was "kicked out" a twelve-month ago, is again seeking election. Mr. Pratt floated in upon the strength of irresponsible statements with reference to the Corporation gas undertaking, which he regarded as corrupt; but during the three years he was in office, he distinguished himself by doing nothing except that he quarrelled with Mr. Smith, the Gas Manager, over a personal matter. He is on the old tack again; and in an address to the electors last night, he made an attack on Mr. Smith which the newspapers have declined to publish. One of the positions he takes up is, that the introduction of stoking machinery at the gas-works had produced no saving, but the reverse. He claims to have proved this from the books of the department; but my recollection is that all that he proved was that a higher wages bill was being paid to the men who were employed—which, of course, was quite natural, considering the increase of the output. The community are satisfied, and rightly so, with the management of the gas department; and if Mr. Pratt had wanted an election cry which would be of use to him, he should have adopted something else.

It is pleasant to turn from the controversial, if not abusive, aspect of affairs as disclosed at Aberdeen, to the informational which I find existing at Hamilton. There the candidates for municipal honours have not been able to discover anything wrong with the management of the gas-works, which is a fact to be noted, because there is a great temptation, when seeking the suffrages of the people, to show that there has been mismanagement in some of the public departments. Instead of this, all that the candidates have been able to show at Hamilton is that, while it was estimated that the renovation of the gas-works would cost £12,800, the work had been accomplished at much smaller cost; and that, too, while the Corporation were deprived, by death, of the services of Provost Archibald, who was Convener of the Gas Committee, and of Mr. Johnstone, the Gas Manager. One o the candidates paid a tribute to Mr. Ewing, the new Manager, for his energy, perseverance, and skill, which it is quite refreshing to hear. The same gentleman stated that the amount derived from tar last year was only £693, as compared with £1950 the previous year; and he gave it as his opinion that, with the heavy outlay for street repairs—amounting to about £25 per month—arising from the subsidences which are caused by mineral workings, and while they continued to sell gas at 2s. 11d. per 1000 cubic feet, they could not expect a surplus at the end of the current year. Another very sensibly remarked that he hoped they would give the Manager the best coal to produce gas with; because, though it was believed that the electric light was the light of the future, it was so much in its infancy that it would be injudicious to be in a hurry to introduce it. Hamilton is to be congratu lated on the existence of such sentiments among its public men.

The ratepayers of Carnoustie, one of the most popular seaside resorts on the east coast of Scotland, having, in May last, rejected a proposal to acquire a water supply from the Dundee Water Commission, which would have entailed a water-rate of 1s. 7d. or 1s. 7½d. per pound, it devolved upon the Police Commissioners of the burgh to find another source of supply. This they have now done, after consultation with Mr. Copland, of Glasgow. A meeting of the Police Commission was held last night, at which a scheme by Mr. Copland was submitted, by which it is proposed to obtain a water supply from the Pitairlie burn; and the Commissioners adopted it. Two schemes were put forward by Mr. Copland, in one of which he suggested a reservoir of 38 million gallons, and in the other a reservoir of about 51 million gallons capacity. The Commissioners adopted the former, which will entail a water-rate of 1s. 6d. per pound. A Provisional Order is to be applied for in the next session of Parliament for the execution of the necessary works.

The Aberdeen Town Council having failed to come to terms with the County Council with reference to the questions relating to the alleged pollution of the River Dee, yesterday unanimously approved of a proposal by the Water Committee to proceed in Parliament next session with a Bill, to enable them to compel the County Council to abate the nuisance of pollution. They also desire to increase the capital of the undertaking by £72,000, in terms of a report by Mr. J. M. Gale,

for the purpose of constructing additional filters at Invercannie, where the water is abstracted from the Dee; and to construct a new service reservoir at Kittybrewster, for the northern portions of the city. It was stated in the Town Council that the consumption of water in Aberdeen is as high as 55 to 59 gallons per head per day; and it is intended to try to reduce this by means of Deacon's waste-water meters.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Oct.* 29.

Sulphate of Ammonia.—A sudden change has come over the market. Buyers have thrown off all reserve, and are now most eager to pick up parcels in all positions, if they can be obtained at anything near the old prices. This improvement may be, as it is said, principally due to the advance in nitrate; but, whatever the cause may be, the fact has been plainly divulged, that sulphate is urgently required both by dealers and consumers. Germany is most earnest in satisfying her requirements, although the advanced prices now asked will no doubt check business for a little while; America has come in, and France and Spain are slowly waking up. Stocks meanwhile are exceedingly low, which, in view of the demand, augurs well for the immediate future of the market. Prices to-day are quoted at £10 2s. 6d. to £10 5s. Nitrate is firm at 9s. to 9s. 3d.

LONDON, *Oct.* 29.

Tar Products.—There is a somewhat better demand for 50 per cent. benzol; and toluol appears to be quite scarce, although there is no improvement in its value. Ninety per cent. benzol is neglected; and the best price that can be obtained at the moment is 1s. 6½d. Solvent naphtha is in good odour; and important business has been done in this article. There is a good deal of inquiry for carbolic acid; and the price is distinctly a fraction firmer. Anthracene is well held; but buyers remain indifferent. More business is being done in creosote and common oils; but values keep low. Pitch holds its own; and considerable shipments are being made. Prices are as follows: Tar, 10s. Pitch, 27s. 6d. Benzol, 90's, 1s. 6½d.; 50's, 1s. 3½d. Toluol, 1s. 2d. Solvent naphtha, 1s. 1d. Crude benzol naphtha, 30 per cent., 7½d. Creosote, 1⅞d. Creosote salts, 20s. Pressed naphthalene, 45s. Carbolic acid, 60's, 1s. 3d.; 70's, 1s. 7d.; crystals, 5½d. Cresol, 10½d. Anthracene, 30 per cent., "A" quality, 9d. (nominal); "B" quality, 7d. (nominal).

Sulphate of Ammonia.—Large business is reported in this article; and price in all positions is undoubtedly firmer—to-day's values averaging £10 to £10 2s. 6d., less 3½ per cent. discount. Gas liquor (10-oz.) is quoted at 6s. to 7s. per ton.

COAL TRADE REPORTS.

Lancashire Coal Trade.—With the close of the month, there has been some slight hardening up here and there in the better qualities of round coal; but this has only been a levelling up to last winter's rates, where concessions were made during the summer months. There is still no pressure with regard to the future; and supplies continue ample for present requirements. At the pit mouth, best Wigan Arley averages 12s. 6d.; but Pemberton four-feet and second qualities of Arley can still be bought at 10s. to 10s. 6d., and common house-fire coal 8s. 6d. to 9s. per ton. The lower qualities of round coal, for iron-making and general manufacturing purposes, continue a general drug throughout the district; and prices are weak and irregular. At the pit mouth, 7s. 6d. remains about the average figure for good ordinary qualities of steam coal. But to clear away surplus supplies, 6d. under this figure is frequently taken; and it is difficult to give any really fixed quotations where anything like quantities are concerned. Engine classes of fuel move off fairly well, and prices are steady at late rates; but the buying going on is still only from hand to mouth, owing to the unsettled outlook in the cotton trade. Ordinary qualities of burgy still average 6s. to 6s. 3d.; best slack, 5s.; medium, 4s. to 4s. 3d.; and common qualities, 3s. 3d. to 3s. 6d. per ton. In the shipping trade, there has perhaps been rather more doing; but no better prices are ruling—8s. 6d. to 8s. 9d. representing the full average figure for good ordinary qualities of steam coal delivered at the ports on the Mersey, and special sales have in some cases been made at as low as 8s. per ton. Coke is not in quite such active demand; but there is no quotable change in prices.

Northern Coal Trade.—The coal trade is now assuming something of its winter aspect—the demand for steam coals being smaller, and that for gas and household coals increasing with some rapidity. Best Northumberland steam coals are still quoted at 9s. 6d. per ton f.o.b.; but it is believed that in a few cases concessions are made to obtain full trade for some of the collieries. Second-class coals are about 9d. per ton lower; and small steam coals are still very abundant, and may be had at from 3s. 6d. to 4s. per ton. Bunker coals are rather weaker, the supply being large and the demand restricted—a number of steamers having been for weeks laid idle at some of our ports. The price of unscreened bunker coals varies from 7s. up to 8s., according to quality; whilst for best Durham screened qualities, as high as 10s. per ton is asked. Household coals are in larger demand; but there are complaints at the high prices that are charged so near to the pit. Manufacturing coals are quiet. In gas coals the demand is now very large. For odd cargoes, the price asked is from 7s. 6d. to 8s. 6d. per ton f.o.b.; but the contracts that are now being settled are at lower prices. One heavy contract for Spain is believed to have been arranged at a price equal to 6s. 10½d. per ton—a low range, and one that may lead to some remonstrance on the part of the miners, who are beginning to watch these contracts closely. The output of gas coal is now very well maintained; and the shipments are well kept up. Coke is rather easier for export, there having been some diversion of orders of late. For local blast furnaces, the price is now about 13s. 6d.; for export it varies from 14s. 9d. to 15s. 6d. per ton. Gas coke is a little more in demand for shipment; and there has been some difficulty in obtaining deliveries, despite the enlarged production. The price is lower in some instances—one lot over next year having been contracted for at about 6s. 6d. per ton at the works.

Scotch Coal Trade.—The prospect does not brighten. At present, the most notable feature of the trade is the diligence with which the men are now working; and, as the result, it is anticipated that stocks will very soon accumulate, and some pits may even be closed before the year is out. The Fifeshire miners have just accepted a reduction of 6d. per day. Foreign orders are pretty well worked off; and home consumption continues to go down. North of England coal is selling at much the same figure as Scotch coal, which points to the necessity for an immediate lowering of prices in Scotland. The rates quoted are: Main, 6s. 9d. to 7s.; ell, 8s. to 8s. 3d.; splint, 7s. 6d. to 7s. 9d.; and steam, 9s. 3d. to 9s. 8d. per ton. Forward orders can be secured at, it is reported, about 3d. per ton below these prices. During the past week, the shipments amounted to 172,907 tons—an increase of 8854 tons upon the preceding six days, and of 30,256 tons over the corresponding week of last year. For the year to date, the total exports have been 6,245,341 tons—an increase this year of 781,508 tons.

Electric Lighting at Portsmouth.—The foundation-stone of the electric light station for Portsmouth was laid last Thursday. The system to be adopted is the invention of Professor Garnett; and the work will cost £60,000. It is proposed to light two miles of the sea wall and four miles of the principal thoroughfares by means of 124 arc lamps, each of 2000-candle power. The lighting, it is hoped, will be in operation next August.

The Eccup Reservoir of the Leeds Corporation.—The repairing of the embankment of the Eccup reservoir of the Leeds Corporation has turned out to be a very expensive piece of work. The Water Committee have lately had before them a report by Mr. G. H. Hill, C.E., of Manchester, on the position of the matter. In this, he states that the bottom of the trench has now been carried down to a lower level; and a satisfactory foundation has been met with. When a short length at the south end of the trench has been sunk a little deeper, he is satisfied that refilling the whole length may be commenced. An extension of the trench to the north will also have to be made. The embankment is seriously affected for a distance of not less than 110 yards; but it is not possible to determine conclusively the length to which the trench will have to be extended, until the excavations have revealed the state of the work. The Committee visited Eccup last week, in company with their Engineer (Mr. T. Hewson), and have decided to proceed with the extensions.

Lancaster and the Electric Light.—At last Wednesday's meeting of the Lancaster Town Council, the principal business was the consideration of a report of a Sub-Committee who have been making investigations in regard to lighting the streets of the borough with electricity. After visiting various installations in different parts of the country, the Sub-Committee unanimously came to the conclusion that the low-tension system, which is in use at Bradford, Preston, and elsewhere, would be the best adapted for Lancaster. They recommended that the Brush Electrical Engineering Company, Crompton and Co., and Mather and Platt should be invited to furnish the Corporation with a complete scheme and detailed specification for the lighting of the borough, together with estimates of the cost at which they would be prepared to carry out such a scheme. During the discussion, Mr. Helme explained that the consumption of gas within the borough was advancing by considerable leaps; and that, unless the electric light was adopted, a large expenditure would have to be incurred in connection with the gas-works. It was stated that the primary intention was to light the street-lamps, although tradesmen and others would be able to use the light on terms which would be about equal to the cost of gas. The report was adopted.

The Brewers' Exhibition.—The fourteenth annual exhibition of machinery and implements used by brewers and allied traders, which was held, under the management of Messrs. Dale and Reynolds, at the Agricultural Hall, Islington, last week, was less noteworthy than that of last year as far as the display of gas lighting appliances is concerned. Nevertheless, there was a very creditable show of regenerative lamps. One of the latest types of these—the Deimel—attracted the visitor's notice in the approach to the exhibition; the Company who hold the patents for this lamp having a stand in the Arcade. In the exhibition itself, the Wenham Company, Limited, made an excellent display of their lamps at the stand of Messrs. Barnett and Foster; though at that of Messrs. Dan Rylands, Limited, they were scarcely so successful. Wenham lamps were employed for the lighting of several stalls; whereas at others, preference was given to the Thomas lamp. Messrs. Henry Greene and Sons' latest speciality—the 'Vertmarche" lamp—described in the JOURNAL for Sept. 6 last, was in use at a stand in the body of the hall and at another in the gallery. All these lamps were doing effective service. A large and very fine show of gas lighting, cooking, heating, and ventilating appliances was made by Messrs. W. Sugg and Co., Limited; while the Davis Gas-Stove Company, Limited, had a representative collection of their stoves and other articles. Other gas-stoves were exhibited by Messrs. H. Darwin and Co., Messrs. S. Clark and Co., and the Wilson Engineering Company, Limited. Gas-engines of various powers were supplied by the British Gas-Engine Company, Limited (who showed a new engine, which they have called the "Utilité"); the Campbell Gas-Engine Company Limited; Messrs. Dick, Kerr, and Co., Limited; and the Trent Gas-Engine Company, Limited. Gas-regulators were shown by Messrs. Slatter and Watkins and Messrs. J. Stott and Co. As water rather than gas is the fluid employed by brewers, this brief reference to the exhibition should not close without mentioning that Messrs. Le Grand and Sutcliff, Messrs. C. Isler and Co., and Messrs. A. Williams and Co. contributed appliances for sinking tube wells; and the Pulsometer Engineering Company, Limited, and Maignen's Filtre Rapide Company, Limited, showed pumps and appliances for raising, purifying, and softening water. Brewing machinery, like all other, requiring lubrication, the stand of Messrs. G. Skudder and Co., with its samples of cylinder and other oils, boiler fluid, asbestos manufactures, &c., was quite in place in the exhibition, which, as in previous years, was attended by a very large number of visitors.

Sales of Shares.—Last Wednesday, 800 £10 shares in the *Willenhall Gas Company* (the maximum dividend on which is 7 per cent.) were sold by auction at £14 and £14 2s. 6d. each.——The following shares in the *Maidstone Gas Company* were disposed of by public auction last Thursday: Three £50 shares, at £101 each; one, at £100 10s.; fourteen, at £100 apiece; and twelve, at £99 each. Twenty £25 shares were also sold—six realizing £50 each; and fourteen, £49 10s. each. Twenty £10 preference shares in the *Maidstone Water Company*, put up in four lots of five each, fetched £14 10s. per share for the first three lots, and £14 per share for the remaining lot.

A New Gasholder for St. Helens.—A new holder has recently been completed at St. Helens; and it is expected that it will be charged with gas this week. The holder, the erection of which has caused the Corporation Gas Committee and the Manager (Mr. S. Glover) much anxiety, will afford storeage for a million cubic feet of gas, which is more than the total capacity of the three holders at present in use. Hitherto the storeage has been very inadequate; but the new holder will make the Manager and the Gas Committee independent of any hitch at the works. The holder, which has been built on land belonging to the Corporation in the Knowsley Road, has cost £8000.

The Suggested Municipalization of the Chatham Water-Works.—At a meeting of the Chatham Town Council last Thursday, the Water Committee reported that the Directors of the Brompton, Chatham, Rochester, and Gillingham Water Company had refused to receive a deputation on the question of the municipalization of the water-works; the Directors stating that they were not prepared to entertain the question, as they considered the proposal was unnecessary. Notwithstanding this, a Committee was appointed to wait upon the Directors. The Local Authorities of Rochester and Gillingham are also considering the question as to whether they shall oppose or co-operate with Chatham in the matter.

The Public Lighting Dispute at Honiton.—The dispute between the Corporation of Honiton and the lessee of the Gas-Works (Mr. T. B. Purnell, of Exeter) has been settled by the latter consenting to surrender the lease to the Honiton Gas Company at a valuation. This fact was communicated to the Corporation by the Chairman of the Company, after the streets had been lighted by oil-lamps for a week. At the Council meeting on the 24th ult., many questions were put to him as to improved lighting, &c.; and he stated that he had settled matters with the lessee, and would undertake to light the lamps on the old terms until a more satisfactory arrangement could be come to. He hoped, however, the Council would not ask too much, as taking over the works would cost a great deal of money. No doubt this will be so, as we understand the lease has about 8½ years to run; and, seeing that the price of gas coal has gone down considerably, and is likely to drop still lower, the lessee will have to receive compensation for surrendering. Two able engineers have been appointed Arbitrators; and an Umpire has been named, to act if required. The transfer of the undertaking is expected to take place about the 14th inst. We congratulate all parties on this solution of the difficulty. The lessee will probably not be sorry to part with the works; and, on the other hand, it is quite the correct thing that they should be managed by their owners.

Serious Damage to the Milwaukee Gas-Works by Fire.—A telegram from Milwaukee which reached London last Saturday, through Reuter's Agency, brought news of a terrible conflagration which had broken out in that city, and had reduced half of it to ruins. It originated at a wholesale oil and spirit store in East Water Street; and, as a strong wind was blowing at the time, it soon spread eastward. Unfortunately, it was not the case here as it was at St. John's, Newfoundland, recently, where the fire travelled away from the gas-works, but the very contrary; and when the flames attacked them, we are told there was not a single stream of water to resist their ravages, and the whole place was soon ablaze. The buildings, however, were not all destroyed; and, although the gas went out in many parts of the city, the "great oil-tanks," the telegram says, "remained intact." The blowing up of houses with dynamite was resorted to, in order to stop the progress of the flames. The quarter of the city most badly affected was thickly populated by Irish, Germans, Italians, and Poles. Milwaukee has not had such a fire for upwards of twenty years. The reflection on the sky was, according to a Dalziel telegram, visible in Chicago, 85 miles distant. The loss is estimated at $10,000,000, the Gas Company's being put down at $300,000; and, unhappily, several lives have been sacrificed. The latest theory as to the origin of the outbreak is that it was caused by the explosion of a barrel of oil.

Starting of a New Gasholder at the Eccleshill Gas-Works.—Last Wednesday, the Directors of the Eccleshill Gas Company formally inaugurated the new gasholder at their works. The ceremony of opening the valves was performed by the Chairman (Mr. J. Bower); and at its close the visitors partook of luncheon in the Board-room. The toasts proposed included the health of the Engineer (Mr. J. Lee), who had successfully carried out the building of the tank and holder. The contractors for the latter (Messrs. R. Dempster and Sons, Limited, of Elland) were also complimented upon the satisfactory manner in which they had completed the work.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 764.)

Issue.	Share	When ex-Dividend.	Dividend or Div'd Bonus.	NAME	Paid per Share	Closing Prices	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	14 Oct.	10½	Alliance & Dublin 10 p. c.	10	16—17	..	6 3 6
100,000	10	,,	7½	Do. 7 p. c.	10	10¾—11½	..	6 10 5
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	105—107	..	4 13 4
100,000	20	27 May	8	Bahia, Limited	20	11—12	+½	13 6 8
200,000	5	12 May	7½	Bombay, Limited	5	6—6½	..	5 15 9
40,000	5	,,	7½	Do. New	4	4—4¼	..	6 13 4
380,000	Stck.	12 Aug.	12½	Brentford Consolidated	100	212—217	..	5 10 7
150,000	,,	,,	9½	Do. New	100	163—168	..	5 10 1
220,000	20	15 Sept.	11½	Brighton & Hove Original	20	40—42	..	5 9 6
888,500	Stck.	31 Aug.	5	Bristol	100	102—107	..	4 13 5
320,000	20	29 Sept	11½	British	20	42—44	..	5 2 3
50,000	10	31 Aug.	11½	Bromley, Ordinary 10 p. c.	10	19—20	..	5 15 0
51,510	10	,,	8½	Do. 7 p. c.	10	14½—15½	..	5 9 8
328,750	10	—	—	Buenos Ayres (New) Limited	10	7—8	..	—
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	97—100	+1	6 0 0
150,000	20	12 Aug.	8	Cagliari, Limited	20	25—27	..	5 18 6
550,000	Stck.	14 Oct.	13	Commercial, Old Stock	100	232—237	+1	5 9 8
165,000	,,	,,	10	Do. New do.	100	180—185	+1	5 8 1
160,762	,,	15 June	4½	Do. 4½ p. c. Deb. do.	100	123—128	..	3 10 4
800,000	Stck.	15 June	10	Continental Union, Limited	100	227—232	..	4 6 2
200,000	,,	,,	7	Do. 7 p. c. Pref	100	190—195	..	5 2 7
75,000	Stck.	15 Sept.	10	Crystal Palace District	100	185—190	..	5 5 3
486,090	10	28 July	10	European, Limited	10	19½—20½	..	4 17 7
354,060	10	,,	10	Do. Partly paid	7½	14—15	..	5 0 0
5,470,820	Stck.	12 Aug.	12	Gaslight & Coke, A, Ordinary	100	217—222	+2½	5 8 1
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	95—98	..	4 1 7
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	257—262	..	3 16 3
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	116—121	..	4 2 7
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	166—171	..	4 7 8
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	162—167	..	4 3 10
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	255—260	..	3 16 11
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	100	150—154	..	3 17 11
1,061,150	,,	15 June	4	Do. 4 p. c. Deb. Stk.	100	118—121	..	3 6 1
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	123—127	..	3 10 10
908,000	,,	,,	6	Do. 6 p. c. do	100	164—169	..	3 11 0
3,800,000	Stck.	12 May	12	Imperial Continental	100	228—231	..	5 3 10
75,000	5	15 June	6	Malta & Mediterranean, Ltd.	5	4—4½	..	6 13 4
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	100	106—108	..	4 12 7
541,920	20	15 June	5	Monte Video, Limited	20	14—15	..	6 13 4
150,000	10	27 May	10	Oriental, Limited	5	8¼—8¾	..	5 14 3
60,000	5	29 Sept.	7	Ottoman, Limited	5	4—5	..	7 0 0
166,870	10	—	2	Pará Limited	10	2—3	..	—
420,000	100	3 May	6	People's Gas of Chicago— 1st Mtg. Bds.	100	106—110	..	5 9 1
500,000	100	1 June	6	2nd Do.	100	104—106	+3½	5 13 2
150,000	10	—	—	San Paulo, Limited	10	8¼—9¼	−1	—
500,000	Stck.	31 Aug.	15½	South Metropolitan, A Stock	100	287—292	+4½	5 6 2
1,350,000	,,	,,	12	Do. B do.	100	232—237	+2	5 1 3
230,000	,,	,,	13	Do. C do.	100	240—245	..	5 6 1
725,000	,,	14 July	5	Do. 5 p. c. Deb. Stk.	100	140—144	..	3 9 6
60,000	Stck.	31 Aug.	11½	Tottenham & Edm'nton, "A"	100	225—230	..	5 0 0
				WATER COMPANIES.				
743,952	Stck.	1 July	10	Chelsea, Ordinary	100	245—250	..	4 0 0
1,720,252	Stck.	14 Oct.	8	East London, Ordinary	100	197—202	..	3 19 2
544,440	,,	1 July	4½	Do. 4½ p. c. Deb. Stk.	100	140—144	..	3 2 6
700,000	50	1 July	8½	Grand Junction	50	102—107	+2	3 19 5
708,000	Stck.	12 Aug.	11	Kent	100	264—269	+1	4 1 9
1,043,800	100	1 July	9½	Lambeth, 10 p. c. max.	100	215—220	..	4 6 4
406,200	100	,,	7½	Do. 7½ p. c. max.	100	190—194	..	3 17 3
279,700	Stck.	29 Sept.	4	Do. 4 p. c. Deb. Stk.	100	122—125	..	3 4 0
500,000	100	12 Aug.	12½	New River, New Shares	100	320—330	..	3 13 6
1,000,000	Stck.	28 July	4	Do. 4 p. c. Deb. Stk	100	128—132	..	3 0 7
902,300	Stck.	15 June	6½	S'thwk & V'xhall, 10 p. c. max.	100	147—150	..	4 6 8
126,500	100	,,	6½	Do. D 7½ p. c. do.	100	134—138	..	4 14 3
1,155,066	Stck.	15 June	10	West Middlesex	100	240—245	..	4 1 7

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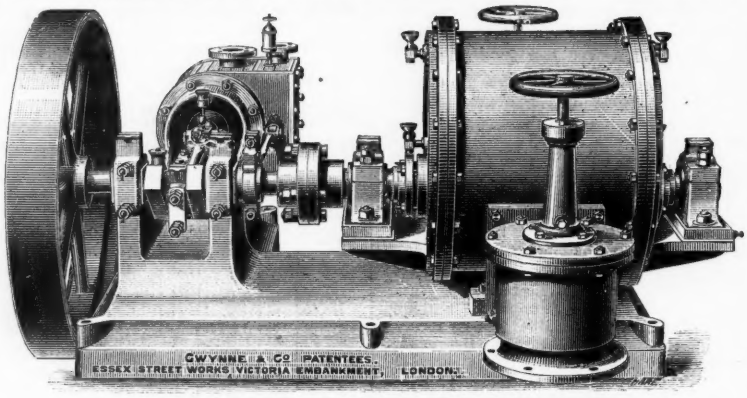

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FOR SALE—A perfectly new 20,000 cubic feet per hour EXHAUSTER, with Steam-Engine combined, including Hydraulic Gas Governor, Bye-Pass Valves, and Connections.
For further particulars, apply to Mr. T. G. MARSH, 41, Corporation Street, MANCHESTER.

FOR SALE—A Second-hand Rotary EXHAUSTER and ENGINE combined, 5000 feet per hour, by Donkin; new in 1889. Also four D MOUTHPIECES, 14 in. by 12 in., with Lids, Ascension, and H Pipes.
Apply to W. YATES, Manager, Gas-Works, Hoylake, CHESHIRE.

THE Newton-in-Mackerfield Improvement Commissioners invite TENDERS for the construction and erection of a GASHOLDER, 98 feet diameter and 24 feet deep, at their Gas-Works, Newton-le-Willows, according to Drawings and Specification, which may be seen at my Office, to whom tenders (endorsed) are to be delivered before Noon on Monday, Nov. 14, 1892.
The lowest or any tender will not necessarily be accepted.

RICHARD BRIERLEY,
Engineer and Surveyor.
Town Hall, Newton-le-Willows,
Oct. 29, 1892.

COUNTY BOROUGH OF SALFORD.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the ALTERATION of a 150 feet diameter GASHOLDER at their Regent Road Works.
Full particulars may be obtained from the Gas Engineer, Gas Offices, Bloom Street, Salford.
Sealed tenders, endorsed "Gasholder," addressed to the Chairman of the Gas Committee, to be delivered to me before Five p.m., on Thursday, the 17th of November next.

By order,
SAML. BROWN, Town Clerk.
Town Hall, Salford,
Oct. 22, 1892.

FIRE-CLAY GOODS.

THE Directors of the Sheffield United Gaslight Company invite TENDERS for the supply of FIRE-CLAY GOODS (Retorts, Bricks, &c.) required for repairs at their Neepsend and Effingham Street Stations, during the next Twelve Months.
Specifications and Forms of Tender may be had on application to the Company's Engineer, Mr. Fletcher W. Stevenson.
The Directors do not bind themselves to accept the lowest or any tender.
Sealed tenders, marked "Tender for Fire-Clay Goods," must be delivered by post, addressed to the undersigned, not later than Saturday, Nov. 5 next.

HANBURY THOMAS,
General Manager.
Commercial Street, Sheffield,
Oct. 12, 1892.

TO IRON ROOF MANUFACTURERS, ETC.

THE Directors of the Sheffield United Gaslight Company invite TENDERS for the construction of an IRON ROOF, 246 feet long by 60 feet wide, with Columns and Girders to carry the same, to cover a portion of their Coal Sidings.
Forms of Tender with Bill of Quantities may be obtained, and the Drawings may be seen, upon application to the Engineer, Mr. Fletcher W. Stevenson, at the Company's Offices, Commercial Street.
The Directors do not bind themselves to accept the lowest or any tender.
Sealed tenders, marked "Tender for Iron Roof," and addressed to the undersigned, must be delivered at the Company's Offices by post not later than Monday, the 7th day of November next.

HANBURY THOMAS,
General Manager.
Commercial Street, Sheffield,
Oct. 12, 1892.

NOW READY.

GAS AND WATER CO.'S DIRECTORY, 1892.
Sixteenth Annual Issue, 5s.
GAS-WORKS STATISTICS, 1892.
Fourteenth Annual Issue, 3s. 6d.
WATER-WORKS STATISTICS, 1892.
Twelfth Annual Issue, 2s. 6d.
Handsomely Bound in One Vol., Price 10s.

LONDON: HAZELL, WATSON, & VINEY, Ltd., 1, CREED LANE, E.C.

TO IRON MERCHANTS AND OTHERS.

THE Milton-next-Sittingbourne Improvement Commissioners invite TENDERS for the supply and delivery of 21 tons of 3-inch CAST-IRON SOCKET and SPIGOT PIPES, and 7 tons of 2-inch Ditto, and also for a quantity of BENDS and SYPHONS, the numbers and particulars of which can be ascertained on application to the Manager of the Gas-Works.
Tenders, endorsed "Tender for Iron Pipes," and addressed to the Chairman of the Milton-next-Sittingbourne Improvement Commissioners, must be sent or delivered to me on or before Monday, the 14th of November next.
The Commissioners do not bind themselves to accept the lowest or any tender.

By order,
WILLIAM PARHAM,
Clerk.
Milton-next-Sittingbourne,
Oct. 27, 1892.

TAR AND LIQUOR PURCHASED.

JOHN CLARKSON MAJOR,
(Established 1851,)
Tar Distiller and Manufacturing Chemist,
WOLVERHAMPTON.
SCULCOATS, HULL.

MEIKLEJOHN'S PATENT

Improved Slide-Valve Anti-Dip.

Is perfectly reliable in action, and requires no attention. Has all the advantages of the Dip and Anti-Dip combined.
Is cheap and easily fixed to any form of main.
Will be found the most efficient appliance of the kind yet introduced.
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GAS-WORKS, RUGBY.
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PRESENT production over 3200 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16½ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves about 70 per cent. of excellent Coke. To show the progress of HOLMSIDE COALS, it may be mentioned that the quantity carbonized by the London Gas Companies in 1885 was about 200,000 tons; whereas the present consumption of HOLMSIDE COALS in London alone is at the rate of over

400,000 Tons per Annum.

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NEWCASTLE-ON-TYNE.

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Compiled and arranged by **ALFRED LASS,** Fellow of the Institute of Chartered Accountants.

LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

ALEX. C. HUMPHREYS, M.E.,
General Superintendent & Chief Engineer,
The United Gas Improvement Company, U.S.A.

A. G. GLASGOW, M.E.,
Late General Inspector,
The United Gas Improvement Company, U.S.A.

HUMPHREYS & GLASGOW,

Contracting Engineers for Water Gas Plant,
9, Victoria Street, London, S.W.

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Purchased for Cash against Delivery.

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Worked by THE HARTON COAL CO., LTD.,

Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

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Prices and Analysis on application.

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CANNEL & COAL.

TYNE
BOGHEAD CANNEL.

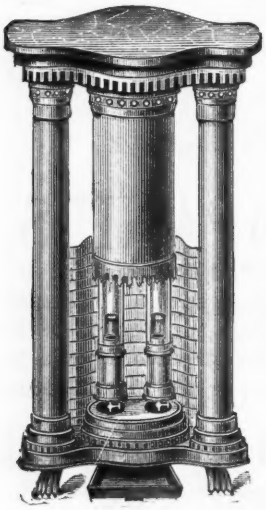
Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

For Prices and complete Analysis, apply to

YOUNG, DANCE, & CO.,
COAL OWNERS, NEWCASTLE-ON-TYNE,
Or E. FOSTER & CO., 21, John St., Adelphi, LONDON, W.C.



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(CLARK'S PATENT.)

Hygienic Gas Heating-Stoves

For Use Without a Flue.

NO FLUE REQUIRED. NO SMOKE. NO SMELL.
NO DIRT OR TROUBLE. NO DANGER.

All Sulphurous Vapours are condensed inside the Stoves, and passed off as liquid into the tray beneath.

The "SYPHON" Hygienic Gas Heating-Stoves give a pure, equable, and agreeable heat, which can be graduated and sustained at the will of the user. They are so constructed that a moist or dry atmosphere is obtained at pleasure.

They are the Only Safe Stoves for use in Greenhouses, Conservatories, Bed-rooms, &c., and especially suitable for Halls, Sitting-Rooms, Offices, Shops, Schoolrooms, and Theatres.

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Illustrated Price Lists on application to

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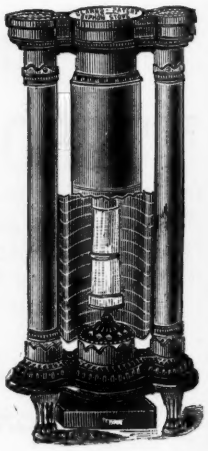

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Quotations and Copy of Analysis on application.
Apply to the Agent to the
EARL OF BRADFORD,
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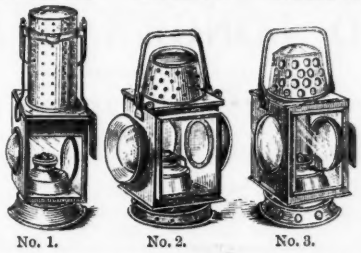
ARMSTRONG'S PATENT
CANDLE SAFETY LAMPS.



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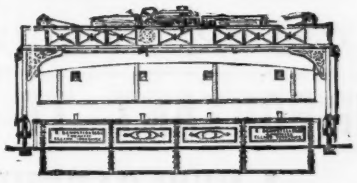

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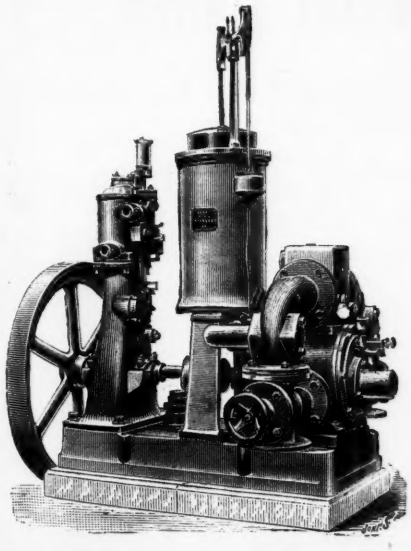

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Designed chiefly for sizes from 500 to 15,000 feet per hour.
CAN BE SEEN IN ACTION AT ADDRESS BELOW.
EXHAUSTERS OF ANY SIZE
COMBINED WITH GAS-ENGINES (now made to vary in speed).
ENGINES & EXHAUSTERS RUN AT DIFFERENT SPEEDS.
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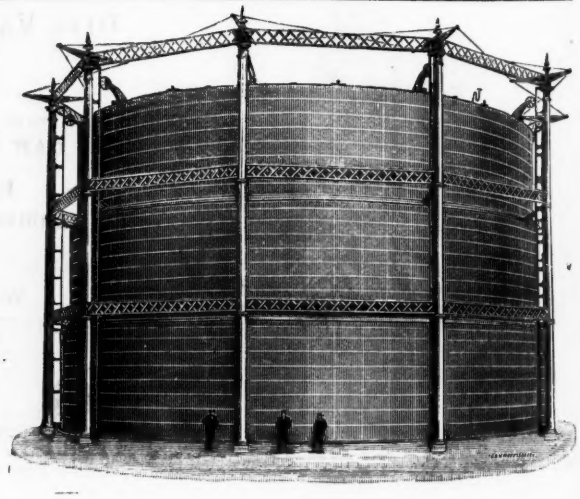

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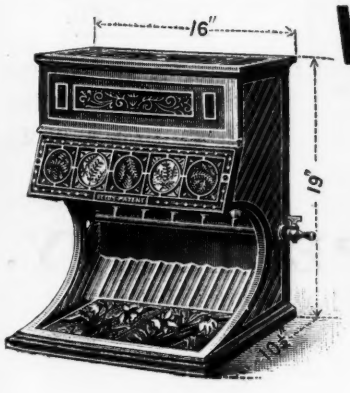

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ALDWARKE MAIN CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

Analysis: 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.
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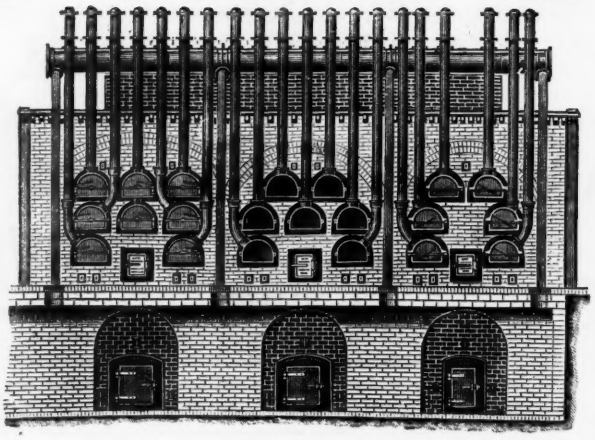

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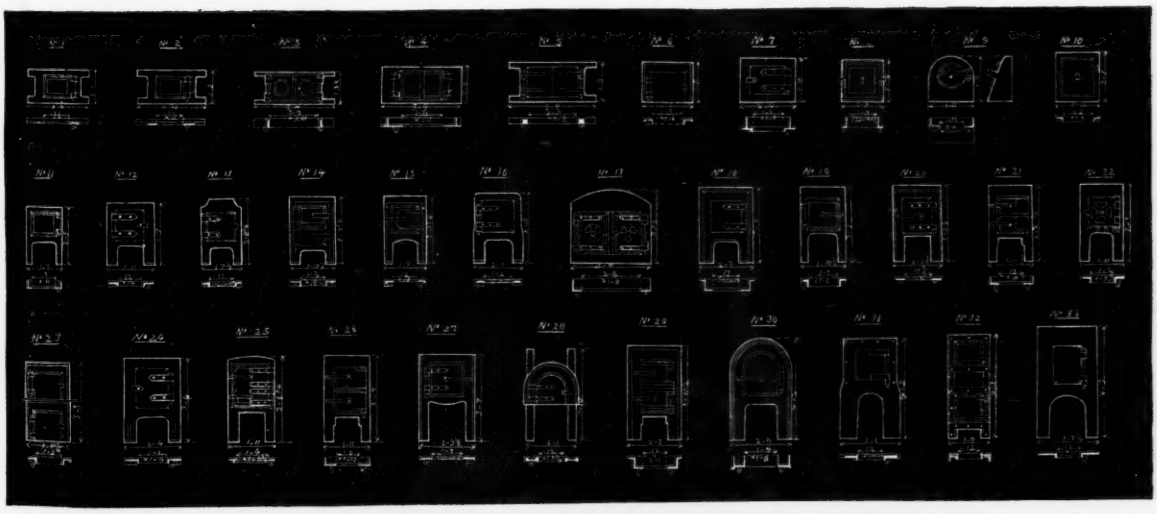

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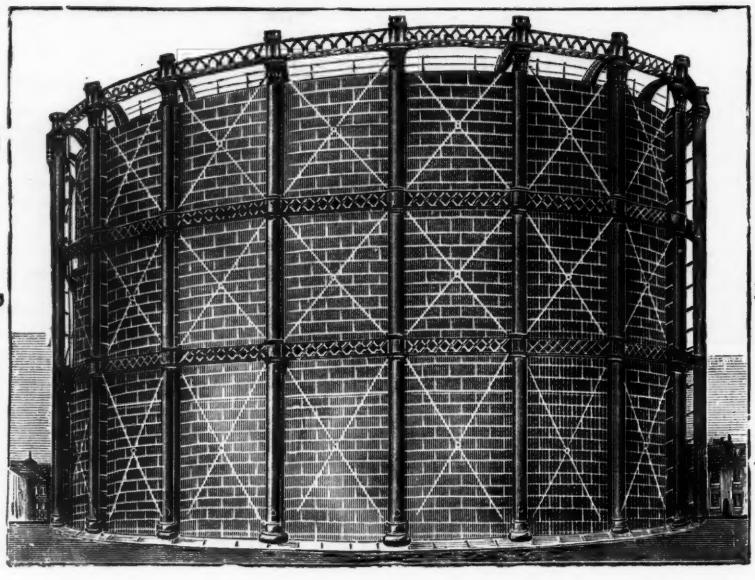

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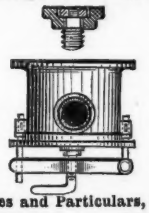

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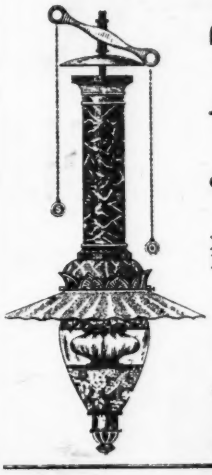

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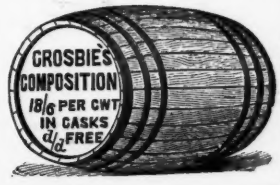

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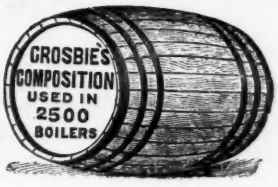

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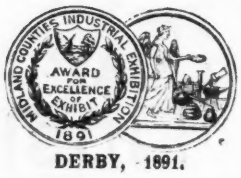

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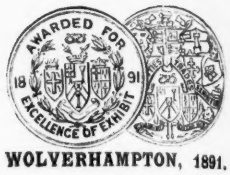

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[See also Advt., p. 760.

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